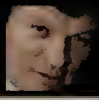
DOMINO'S DELIVERS The pizza delivery giant's 'Net service uses an ordering system that keeps pizzas flowing. Page 20.



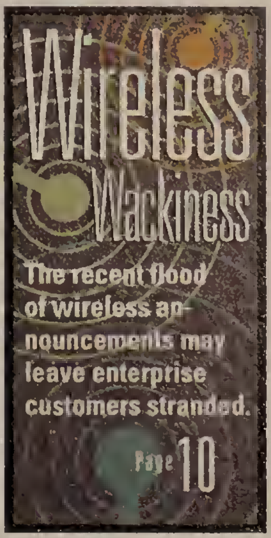
MANDL ON A MISSION Tellgent CEO Alex Mandl sits down with *Network World* to discuss the CLEC landscape. Page 27.

The newsweekly of enterprise network computing

NetworkWorld

March 6, 2000 Volume 17, Number 10

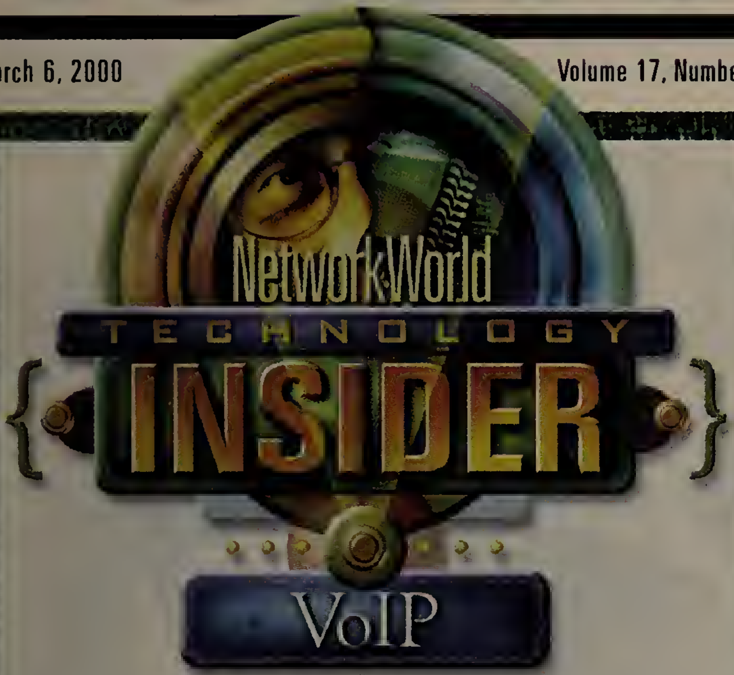
The network portal: www.nwfusion.com



Wireless Wackiness

The recent flood of wireless announcements may leave enterprise customers stranded.

Page 10



THE ROAD TO VoIP

The benefits of voice over IP include cutting network management costs and adding new applications such as unified messaging. But there are several barriers to widespread implementation. **PAGE 50**.

VoIP roadmap: If voice over IP is an absolute must for your organization, here's a guide. **PAGE 55**.

Extreme networking: In Antarctica and Alaska, voice over IP is key. **PAGES 57 and 61**.

Management Strategies: In the coming convergence of voice and data, will the telephone folks come out on top, or will it be the data net professionals? **PAGE 63**.

Online: Interactive Buyer's Guide.

JEFF THOMPSON

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Lucent spinoff will lack full lineup of gear

BY DAVID ROHDE

MURRAY HILL, N.J. — While Lucent last week said it would spin off a new company whose products and services would focus on enterprise customers, it will stop short of populating the new firm with a full range of LAN and WAN products.

The new company, which has yet to be named, will include Lucent's massive PBX and call center operations, plus its LAN switching business and Systimax cabling unit. But the spinoff will lack Lucent's IP access routers, frame relay access devices and virtual private network (VPN) security software — all of which will remain with the

See **Lucent**, page 79

Exodus ups caching ante

Teams with ArrowPoint to speed site performance.

BY APRIL JACOBS

Exodus Communications this week will team with startup switch maker ArrowPoint to offer new caching services that promise to speed Web site performance, reduce bandwidth costs and simplify site integration issues.

Exodus will significantly expand its flagship ReadyCache service — from about 20 data centers today to 50 — using ArrowPoint switches. The ReadyCache service speeds access to customer Web sites and reduces bandwidth costs by placing Web site content closer to users. With ReadyCache, as requests for content are made, the content is stored locally on Exodus servers and reused as

See **Exodus**, page 79

www.nwfusion.com

ALL ABOUT INTELLIGENCE

White paper: Content-aware cache bypass from ArrowPoint.

Download: Exodus' ReadyCache data sheet.

DocFinder 7136 find it online

Surfing for dollars

The latest headache for network professionals and their companies — sites that pay you to surf.

BY CAROLYN DUFFY MARSAN

Think of it as cyber-moonlighting. An influx of Web sites that pay end users to surf, search and send e-mail are enticing employees to use their speedy Internet connections at work to earn a little extra cash while on the clock.

See **Surfing**, page 80.

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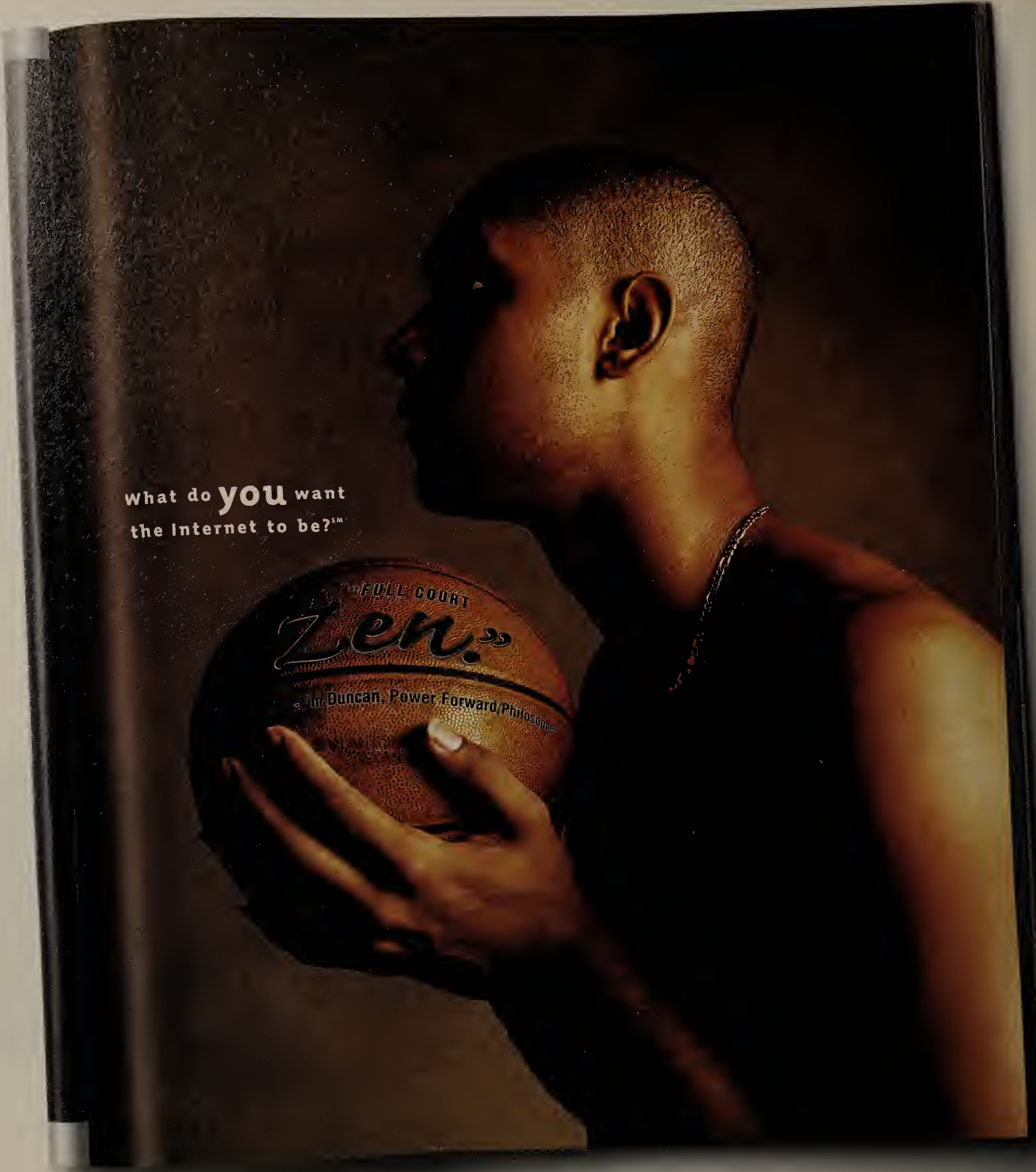

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NetworkWorld

MARCH 6, 2000

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10 The promises and realities of **wireless data**; recent spate of wireless product announcements raises questions about what enterprise customers should expect.
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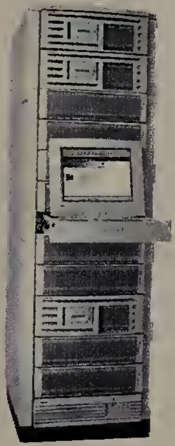

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THIS WEEK ONLINE

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RESEARCH

Spider Bytes: The Web's best tools and tips

Does convergence mean that everything you have in your network today will be obsolete? Not according to Lucent's list of myths about the industry buzzword. Find out what other assumptions are false. **DocFinder: 7126**

Voice-over-IP products and services can be hard to figure out. That's why we have our Buyer's Guide Compare-o-matic that lets you match products to your needs. **DocFinder: 7127**

Newsletters

From the **Frame Relay** newsletter, **DocFinder: 7128**

"Because VPNs based on the Internet are often compared head-on to frame relay, it seems reasonable to consider whether the two types of networks are also similar in their vulnerability to these attacks. The short answer is 'no.' "

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FORUMS

> "Networking cable can make a world of difference in a network. If your network is high-volume and the buildings using it are relatively close together, then a 62 micron cable is your answer."

— from the "Gigabit on the campus" forum, ***DocFinder: 7129***

Other forum topics:

Why do people look for new jobs?

The most obvious answer would be more money. But in fact, being appreciated and having someone concerned about their well-being topped a recent survey of job seekers. **DocFinder: 7131**

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BARNEY'S RUBBLE

The best of the NetFlash daily newsletter

Palm's price skyrockets in initial public offering

Recently we talked about AOL, Motorola and Nokia getting the inside track on Palm's IPO. Each got their shares at the opening price. Let's see how it turned out: AOL and Nokia each bought 2.1 million shares for $35 each, making a total outlay of $73 million. The stock closed at $95, giving each buyer a cool $126 million one-day profit. Poor Motorola — it only made $101 million for the day. **DocFinder: 7139**

Priceline.com and the importance of getting to 'wow'

When the founder of Priceline.com talks about what makes a successful Web site, people listen. Jay Walker says the essence is fairly simple: The site has to make people say "Wow!" You can get the "Wow!" by offering convenience, information, entertainment and savings. And I thought Priceline's success was based entirely on William Shatner's singing. **DocFinder: 7140**

Ericsson brings ads to mobile 'Net phones

I have some good news and some bad news about mobile phones. Soon the services may be free, but they will be filled with annoying ads. Swedish mobile phone kingpin Ericsson will offer wireless carriers technology that will embed ads in 'Net-ready mobile phones. So how many cars will crash because folks are looking at a Victoria's Secret ad? **DocFinder: 7141**

Mitnick schools feds on Hacking 101

And finally, famed hacker Kevin Mitnick has some advice for corporations trying to protect their nets — don't worry so much about the physical stuff such as firewalls — worry about the employees who paste passwords to their screens and give their logons out over the phone. **DocFinder: 7142**

— Doug Barney, executive editor, news

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COLUMNISTS

In the Works

Denial of service: Lessons learned

Last month's denial-of-service attacks raised the hackles of network managers, but IETF Chairman Fred Baker says some good might have come out of it. **DocFinder: 7134**

Keeping Current

Small devices offer up a big letdown

Many users are enamored with the idea of handhelds. And they're even more attracted to the idea of blending these devices with offerings from the Web. But Fred McClimans says the marriage of the two has been a real downer. **DocFinder: 7132**

Help Desk

Changing from IPX to IP

Problem: A reader is converting to a total NT network. She needs to remove IPX/SPX and go to TCP/IP, and wants to know what's involved. **DocFinder: 7133**

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NEWS BRIEFS, MARCH 6, 2000

Palm IPO has ups and downs

Stock in 3Com's Palm unit blasted off last week following an initial public offering in which its share price rose as high as $160 before returning to about half that level in late trading on Friday. Palm Inc.'s leading position in handheld computing devices and its strong sales drove intense interest in its IPO at a time when many publicly offered companies have little or no track record, analysts said. In the days leading up to the IPO, 3Com adjusted the pre-offering price from $15 per share to $30 per share before settling on $38 late Wednesday. Palm held 66% of the U.S. market for handheld devices as of mid-1999, according to IDC, but is facing increasingly tough competition.

EDS expands hosting services

EDS last week said it would expand its repertoire of Web-hosting services to include the business of managing shared and dedicated Web servers within EDS hosting facilities worldwide. Prices will start at under $1,000 per month. EDS indicated it is taking on network provisioning of application service providers as well as offering security services. Until now, EDS had focused on managing Web servers at corporate sites.

Carrier cards still shuffling

The ever-lively flurry of events continued at Qwest Communications last week, as it faced new challenges on all sides. First, Solomon Trujillo, chairman, president and CEO of US West, the local carrier Qwest is acquiring, made public his dissatisfaction and said he will quit when the merger closes. Trujillo said he and Qwest CEO Joe Nacchio "have not found agreement on key strategic issues, including leadership appointments, the structure of the organization and the role of the Office of the Chair." Trujillo has long been seen as less willing to fold his tent and quietly fade into the background than most CEOs of acquired carriers are. Yet Nacchio may find himself in a similar position, as reports surfaced that Deutsche Telekom is building up its corporate coffers to try to acquire Qwest. Deutsche Telekom has long coveted a direct stake in the U.S. telecommunications market. It was not known late last week if Qwest is the German carrier's only target, or whether it may be considering others.

US West CEO Solomon Trujillo says he will quit after merger.

Windows CE making music

Ever want to take your sound and music files on the road? Now you can with the release of Windows Media Player for Windows CE from Microsoft. While Microsoft is targeting consumers looking to download music, the player can be used to play any Windows Media or MP3 audio file. This means corporate users can transfer training and other corporate audio to their player using the Window Media Manager and take it on the road. The player runs on the latest generation of palm-sized PCs from Compaq, Casio and Hewlett-Packard. Both the player and manager transfer agent are free and can be downloaded at www.microsoft.com/windows/windowsmedia/.

AOL shuts out iCAST . . .

The instant messaging wars heated up again last week, as America Online began blocking traffic from iCAST, a music and entertainment Web site in Woburn, Mass. ICAST employs software from Tribal Voice in Denver to support instant messaging between users of AOL's Instant Messenger, Microsoft's MSN Messenger Service, AT&T WorldNet's I M Here and AltaVista's AltaVista Messenger. iCAST went live last Tuesday, and within 36 hours AOL began blocking iCAST traffic to its 45 million AIM users. Tribal Voice officials say AOL has repeatedly failed to return their calls about interoperability between their instant messaging users.

. . . but pledges 'open access'

Subscribers to Time Warner's broadband cable services will not be locked into using America Online or an affiliated ISP after Time Warner merges with AOL, the companies announced last week. Furthermore, the merged AOL/Time Warner organization will not set a limit on the number of ISPs with which it will have commercial relationships, and will allow those ISPs to form partnerships with its cable systems locally, regionally or nationally. The new company also will allow ISPs to offer videostreaming, and will allow ISPs and cable operators with which it deals to work directly with consumers to market and sell broadband service, and for billing and collection. The memorandum of understanding between AOL and Time Warner is expected to lead to a binding agreement as the two work toward merging.

Internet community to debate new domains

BY CAROLYN DUFFY MARSAN

After simmering on the back burner for several years, the debate over new Internet domains — such as .web and .arts — will reach full boil this week at the Internet Corporation for Assigned Names and Numbers (ICANN) meeting in Cairo.

Observers say ICANN will probably adopt new global top-level domains (gTLD) before year-end.

At issue are how many new domains are adopted, what domains are chosen, how quickly they roll out and what protections are provided for trademark owners.

New gTLDs cause legal and management headaches for corporations that feel compelled to protect their brand names in every domain. Most U.S. companies want only a few new gTLDs to be approved, and they want owners of existing domain names to get the first right of refusal for the same names in the new gTLDs.

Meanwhile, domain name registrars, entrepreneurs and non-U.S. companies are pushing for hundreds of new gTLDs to be adopted quickly and without as many provisions to protect corporate interests. This camp argues for selling names in new gTLDs on a first-come, first-serve basis so new ventures can choose from an abundance of possible names.

About 200 Internet executives and users are expected to attend the meeting.

"To some extent, the debate is the old guard vs. the Young Turks, or North America vs. the rest of the world," says Bill Washburn, chief policy officer at RealNames and a participant in ICANN's business and commercial constituency. "The large trademark owners and the existing corporations on the Internet . . . have huge pressures on them to keep a lid on gTLDs if they can."

The 19-member ICANN board, which is supposed to represent the consensus view of the Internet community, will vote to determine the policy on new gTLDs.

Seven new gTLDs — .store, .web, .firm, .nom, .arts, .info and .rec — were proposed by an ad hoc Internet committee about five years ago. The proposal was shelved as the Clinton administration tackled the larger issue of migrating the management of Internet domain names from a government contractor to a nonprofit organization that later became ICANN.

"New gTLDs have been the catalyst for creating ICANN all along," Washburn says. "For ICANN, this debate is the heart of the matter."

ICANN's working group on gTLDs recommends running a test bed with six to 10 new gTLDs. However, the group doesn't agree on whether the new gTLDs should be general-purpose such as .web or special-purpose such as .kids.

Proponents of special-purpose domains say they will help consumers find content and minimize confusion for companies doing business on the 'Net. But it is unclear what organization would govern the awarding of names in these domains to ensure, for example, that pornography is not distributed in the .kids domain.

See **ICANN**, page 14

Be a

Net Know-It-All

For the answer to this week's question and more net trivia, **visit Network World Fusion** and enter **2349** in the DocFinder box.

This week's question:

What three retired professional athletes are behind MVP.com, a new Web-based sports equipment company?

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The promises and realities of wireless data

Recent spate of wireless product announcements raises questions about what enterprise customers should expect.

BY DENISE PAPPALARDO

NEW ORLEANS — Despite a flurry of vendor announcements last week that promise wireless data for everyone, don't expect to access your corporate application servers with a handset anytime soon.

Companies ranging from little-known Net Morf and Logica to Internet bigwigs like America Online announced plans to bring data to wireless users over the 'Net. However, slow wireless networks, suspect security and poor navigation tools will stifle adoption of wireless Web services in the near term, experts say.

"The wireless data market will die a thousand deaths in the business and consumer markets as service providers navigate their way through the quagmire that is legacy networks and technologies," says Bob Egan, a research director at Gartner Group, a Stamford, Conn., consulting firm.

Last week's news runs the gamut, but some of the developments were simply focused on offering users typical Web content. For instance, Motorola plans to include a bookmark on several of its Internet-ready phones that will link users directly to a specially designed Amazon.com Web page.

But more interesting were announcements from Net Morf and Logica, which introduced server platforms Site Morfer and m-WorldPortal, respectively. The servers are designed to let users access corporate applications from any type of mobile phone via the 'Net.

The idea is to set up a portal server that's collocated with a business user's application server. When a mobile user tries to access his corporate network, his request will first hit the portal server. The server determines the type of phone the user has and what application the user is trying to access. The requested information is then form-fitted and presented on the handset. The initial request for data originates on a wireless service provider's network, but the request is then sent to the public Internet, which is how the request reaches the user's corporate network.

This is also the basis for Wireless Knowledge's Revolv service. Revolv lets wireless users access Microsoft Exchange servers using AT&T's cellular digital packet data network, for example.

Oracle has its own take on wireless Web portal services, although the company seems uncertain how to relate the wireless Web to business needs in its newly launched Oracle Mobile.com portal. Denise Lahey, CEO of OracleMobile.com, has vaguely discussed working with Oracle's direct sales force to penetrate corporate accounts, and about hosting content for enterprise customers. But OracleMobile.com's energies are focused on becoming a consumer portal or a service offered by wireless carriers to their wireless phone users.

Strategis Group predicts that 300,000 users will subscribe to wireless Web portal services this year, with that number ballooning to 25 million by 2006. Many of the subscribers will likely be business users.

Such rosy scenarios come brimming with "ifs," however. The lack of security, big-league bandwidth and intuitive clients will initially slow business-driven wireless portal services, says Callie Pottorf, research analyst at IDC, a Framingham, Mass., consulting firm. Wireless users on AT&T, Sprint PCS or Bell Atlantic's networks are generally not going to see data transfer speeds any higher than 14.4K bit/sec, Pottorf says. "That's not optimal for surfing the Web or downloading e-mail," she adds.

When you throw in the fact that some wireless Web portals are designed to let users access corporate applications, you can be sure an IT manager is going to want to see stringent security measures. And when you add encryption, digital certificates or a public-key infrastructure (PKI) system to any data traffic, you're adding overhead, Egan says. Overhead is one thing most wireless networks can't support today, he adds.

But groups such as Baltimore Telepathy and the Wireless Application Protocol (WAP) Forum are addressing security issues. Baltimore Telepathy is a wireless security initiative started by PKI vendor Baltimore Technologies. Twenty vendors last week joined Baltimore Telepathy to focus on developing secure products and a complete electronic security framework for secure mobile commerce, says Steven Kruse, chief evangelist at the Boston firm.

The WAP Forum has been discussing security for some time and has already developed recommendations such as the use of Wireless Transport Layer Security (WTLS) digital certificates instead of using the X.509 Version 3 certificates that are used on most terrestrial networks. WTLS, a nonstandard digital certificate, is believed to be easier to implement and support, Kruse says.

But while vendors talk about the need for security, the fact is wireless networks were built for voice and not for data, Egan says. Securing data will be essential for business users to adopt wireless data services, but that will not happen until the wireless networks support faster transmission speeds

Help may be on the way. One specification called General Packet Radio Service will let global systems for mobile communications (GSM) wireless service providers beef up their networks to about 130K bit/sec by the end of next year. Enhanced data rate for global evolution is designed to speed up both GSM and Time Division Multiple Access wireless networks to about 384K bit/sec, but EDGE won't be available until 2002 or later, Pottorf says. And then there is the third-generation (3G) specifications that are expected to increase wireless data transmission speeds to up to 20M bit/sec, but analysts don't expect to see 3G deployments until 2005 or so.

In the meantime, some systems integrators and users are taking advantage of wireless technology before the carriers speed up their networks. Aether Technologies, a wireless system integrator in Owings Mills, Md., is creating real-time wireless networks for its customers, says David Oros, chairman at Aether.

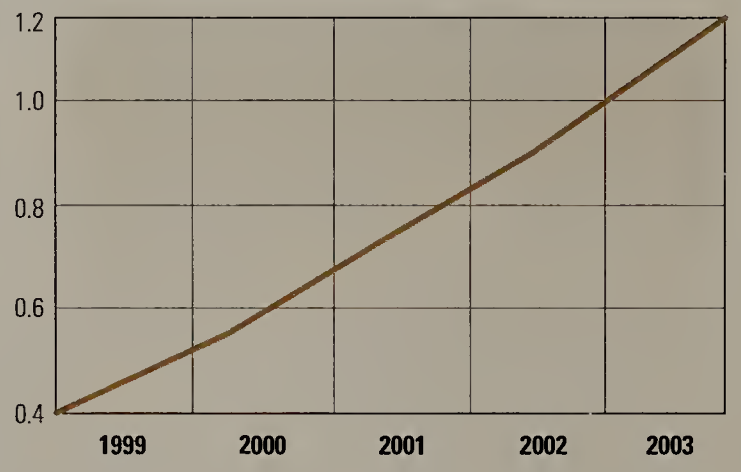
To create these kinds of applications requires software development tools, a rethinking of application design, middleware and expertise with a given handheld operating system and device, both of which have limited resources: small screens, little memory, few buttons. The Web, with its typical latencies, can actually be a bottleneck for these applications.

Network World *Senior Editor John Cox contributed to this story.*

The wireless world

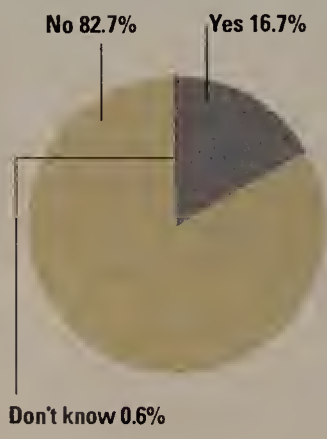
While the number of people using cellular and PCS services is expected to grow . . .

Cellular and PCS subscribers worldwide (in billions)



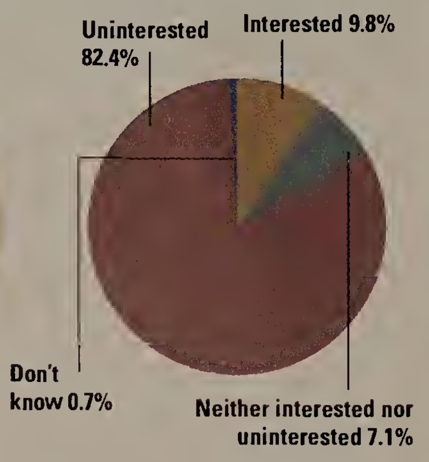
. . . phone-based Internet access currently is not widely used, and few people are interested in the technology, according to a recent survey.

Do you use a connection to the Internet through your cellular or PCS phone on a regular basis?



Respondents: 156*

How interested are you in using a connection to the Internet through your cellular or PCS phone?



Respondents: 591**

* Respondents with phone-based Internet access.
** Respondents without phone-based Internet access.

SOURCE: IDC, FRAMINGHAM, MASS.

Recent wireless announcements

BellSouth Wireless Data: Rolled out a Java-based software architecture with Sun for the development of applications to run on BellSouth's wireless network.

Ericsson: Introduced its first CDMA phone which includes a Wireless Application Protocol browser.

IBM: Founded the SyncML project to create a standard XML-based protocol that will be used to synchronize data between servers and wireless device clients.

Motorola: Announced a deal with Amazon.com that will include an Amazon.com bookmark with several of Motorola's Internet-enabled handsets.

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Sorry, fellas.

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Security glitch hits Foundry switches

BY JIM DUFFY

SUNNYVALE, CALIF. — A security problem has cropped up in Foundry Networks' ServerIron switches that make the devices susceptible to denial-of-service attacks.

According to an advisory posted on the BUGTRAQ mailing list, Foundry's implementation of TCP/IP lets attackers easily predict the sequence of data streams and spoof or hijack sessions. By spoofing sessions, attackers can flood ServerIron switches and attached servers with bogus data, thereby denying service to legitimate traffic.

BUGTRAQ is an independent mailing list in which users discuss security and quality issues. ServerIron switches are used to balance traffic loads between Web servers.

According to the advisory, ServerIron is vulnerable because its management IP address exposes the product's "rather poor" TCP/IP implementation.

All of Foundry's ServerIron switches, including the ServerIronXL, were the subject of a security advisory.

"The predictability exposes sideband information about when the switch is being used by other [possibly legitimate] users," the advisory states.

The advisory was posted by Andrew van der Stock, security architect for e-Secure in St. Leonards, Australia. He declined to comment further on his post. As a workaround, his advisory suggests users filter off telnet, HTTP and SNMP access to the Foundry devices to only trusted management IP addresses. "Better yet," the advisory states, "disable SNMP and the Web interface and completely filter off telnet access. Remote management access is then only available via serial console."

Foundry's workaround: Apply the fix posted on its Web site late last week at www.foundrynet.com/bugTraq.html.

Foundry says it has not received any reports from customers who have been hit with denial-of-service attacks due to the glitch. Some Foundry users contacted by *Network World* last week concurred, but were taking precautions nonetheless.

"I'm dealing with my contacts at Foundry to discuss what they're doing about it and what the potential side effects are," says Yoshio Kurtz, director of development at Proflowers.com. "I'm concerned about it, but if I knew everything that could be wrong with my car, I'd be concerned about that, too."

Stefan Silverman, master technologist at e-business integrator Scient in San Francisco, says the advisory is an overreaction. "The exposure of the management interface or telnet interface to the entire world is the default configuration of every router or switch I've ever used. It's a much wider problem than just Foundry." Silverman was prompted by Foundry to call *Network World.* ◪

Cisco technology boosts content flow

BY JIM DUFFY

SAN JOSE — Cisco last week announced products designed to provide quick delivery of Web and other Internet content across a network.

The so-called service acceleration products are intended to speed the decision-making processes of intelligent Cisco devices. Such decisions — traffic classification, service application and quality-of-service (QoS) policy enforcement — are inherent in content-aware networking, Cisco says.

The new products include a processor for the Cisco 7200 router, called the Network Services Engine-1 (NSE-1); two new Web URL caching devices; and software for firewalling, load balancing, distributing network services across a router, and managing device-level congestion and QoS parameters.

The NSE-1 delivers Layer 3-7 services at OC-3 rates. The services NSE-1 applies to packets include weighted fair queuing, Access Control List filtering, NetFlow accounting and network address translation, among others. Future services will include IP Multicast and traffic shaping, Cisco says.

"The NSE could be the Trojan horse that pulls through some of the other products," says John Morency, an analyst at Sage Research in Natick, Mass. "I don't think users would necessarily buy Cisco because of policy management software. There's got to be an attribute of the product line that they perceive as high-performance, close to best-in-class, common architecture, etc."

The new Web caching products are the Cache Engine 570 and 590. The 570 and 590 feature 22M to 45M bit/sec performance, respectively, and 36G to 144G bytes of storage.

The firewalling software is called Cisco Secure Integrated Software for the Campus. It runs on Catalyst 5000 switches equipped with a Route/Switch Module, and performs stateful packet filtering, intrusion detection and authentication.

For server load balancing, Cisco announced Local-Director Version 3.3 and IOS-SLB for its IOS operating system software. LocalDirector 3.3 provides server load balancing at 15 million packet/sec when used with a Catalyst switch. The box also has e-commerce features, such as binding user sessions tospecific transaction servers through cookie recognition and site/server availability monitoring.

IOS-SLB is an option for Cisco's Catalyst 6000 switches that integrates server load balancing with the switch's security, QoS and routing features.

Cisco also introduced new IOS software for its 7500 routers that distribute network services to each port on the router's Versatile Interface Processor (VIP) modules. The Distributed Services software adds QoS services, such as traffic shaping and queuing mechanisms, multiservice compression and queuing, multicast and NetFlow accounting to each VIP.

For management of accelerated services, Cisco unveiled Internetwork Performance Monitor (IPM) 2.1 and QoS Device Manager (QDM) 1.0. IPM 2.1 performs hop-by-hop packet monitoring to spot heavily congested areas.

QDM 1.0 lets users configure and monitor IOS-based QoS parameters on Cisco routers.

Overall, Cisco succeeds at delivering a high-level message on how it sees content networking evolving for business purposes, says Jim Metzler, an associate at consultancy Ashton, Metzler & Associates in Newton, Mass. However, users could be tripped up in the implementation.

"One thing I don't like about it is how darn complex it's going to be to do all of the things they're talking about," Metzler says. "If you want to accelerate networks, that says you understand where the bottlenecks are. People today don't have a good feel for that." ◪

Cisco's table of content

Cisco's new content networking products include:

Product(s)	Description
NSE-1	Network service processing hardware for the 7200 router.
Distributed Services	Software for the Cisco 7500 router that provides per-port provisioning of access control list, compression, queuing and multicast services.
Cache Engine 570 and 590	URL caching devices for quick Web access.
Internetwork Performance Monitor 2.1	Software that identifies and isolates congestion points throughout an enterprise network.

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BUSINESS WITHOUT INTERRUPTION.™ VERITAS

Citigroup sees entertainment and banking as one

Banking giant hires young hotshots with new media entertainment experience to liven up its online and wireless banking.

BY ELLEN MESSMER

NEW YORK — In its widening e-commerce efforts, Citigroup is casting off the stodgy banker image in favor of an entertainment approach to draw a big crowd on the Web.

To do that, Citigroup has brought in a cast of young hotshots with new media entertainment experience to direct its online and wireless banking activities. Take Larry Rubin, for example. A former executive with media giant Viacom, Rubin was hired a month ago to be Citigroup's "vice president for new e-business" at the Citigroup Web site, finance.com.

Though he has no banking experience, Rubin is in charge of transforming how Citibank, the Citigroup banking subsidiary, will interact with the public for e-commerce purposes. Citibank already has online retail banking, but Rubin says he has many new ideas, such as alerting Citibank customers on their cell phones for financial transactions.

"You didn't pay your real estate taxes for the month. Do you want us to take it out of your account or can I make a loan to you? The cell phone can deliver that message to you," Rubin said during his presentation at last week's Gartner Group Internet and Electronic Commerce conference here.

Rubin says an e-commerce effort branded as citif/i is under way to provide a new array of online financial services that will include offerings not only from Citibank, but also from brokerage houses, competing mortgage firms and insurance companies.

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Ex-Viacom executive Larry Rubin has no banking experience, but that hasn't stopped him from becoming Citigroup's vice president for new e-business.

"At finance.com, it's an agnostic play," Rubin says, with "agnostic" being the favorite term now for an online business presenting competing products in a nonpreferential atmosphere.

"I don't want you to think I'm from a bank. I'm bringing you something different," Rubin declares. "Financial services is different from entertainment, but it is entertainment."

He adds his favorite digital age saying: "Revolutionary times mean e-rational behavior."

George Barto, senior analyst at Gartner Group, a consultancy in Stamford, Conn., points out that Rubin is but one among a cadre of new-media and entertainment-industry hotshots Citigroup has hired to chart its e-commerce future.

Whether it's the right move at the right time remains to be seen, but many analysts believe that the banking industry's traditional grip on customers' accounts and payments is threatened by the Web.

Avivah Litan, Gartner Group's research director for online bill payment and presentment, says banks face the threat of losing their customer bases as nonbanks intercede on the Web to provide bill-payment services.

"In fact, banks are losing this market," Litan remarked last week, adding that research suggests that neither the biller nor the bill payer really care whether their traditional bank or another service provider manages this online billing. It's low price and convenience that will win in the end, he said. ◪

Novell unveils GroupWise upgrade

New BulletProof release will feature enhanced security and usability.

BY DENI CONNOR

PROVO, UTAH — Additional platform flexibility, security and management features will highlight the next release of Novell's GroupWise messaging/ collaboration software, the company announced last week.

Code-named BulletProof, this version of GroupWise has improved Web management and Web client software, and increases the security of the mail system for large global networks.

In addition, a Linux version of GroupWise will be available before year-end, as well as compatibility with a range of wireless appliances. Today, GroupWise runs on NetWare, Solaris and Windows NT.

Novell has also integrated GroupWise more tightly with Novell Directory Services (NDS) and its DirXML Internet directory software. With this integration, in-house developers and software vendors can build connectors between GroupWise and applications that use the Novell directory. For instance, the company's NDS Integration for PeopleSoft connector works with GroupWise to automatically create new user mail accounts when employees join the company and are added to the PeopleSoft database. A tool kit will be available later this year for integrating applications using XML.

The National Board of Medical Examiners' Lopez almost turned to Microsoft Outlook due to GroupWise's lack of integration with other applications.

"It's about time," says Steve Lopez, director of systems and technology at the National Board of Medical Examiners in Philadelphia. "GroupWise's lack of integration with other applications was the biggest caveat I had in staying with the product." Lopez was considering migrating to Microsoft Outlook.

Backup on the way

Novell is also adding backup/ restore technology to GroupWise, which lets network managers protect the mail/ message database against corruption and gives them the ability to retrieve individual or groups of messages that were erased. Secure Sockets Layer (SSL) capability for the transmission of messages between post offices will also be added in the next release.

"SSL has security advantages for companies that are geographically diverse," says Steve Raia, manager of enterprise server systems at Georgetown University in Washington, D.C. "Where a company is passing a lot of its mail between one system and the next across the Internet, the ability to encrypt those communications using 128-bit encryption would be valuable." Georgetown has 40 post offices and 7,500 GroupWise users.

Network managers will also be able to manage GroupWise completely from Novell's ConsoleOne utility. GroupWise was previously administered from the NetWare Administrator utility. And users with the GroupWise Web-based client now have the same capabilities as the GroupWise Windows client. With GroupWise WebAccess, users can now filter their e-mail and perform operations based on rules.

The BulletProof release of GroupWise will be available by year-end. Pricing was not announced. ◪

ICANN,
continued from page 8

"The companies that don't want to see any new gTLDs are more comfortable with chartered ones like .kids," says Bret Fausett, a partner with the Boston law firm Fausett, Gaeta & Lund. "There's not a lot of corporate interest in setting up new generic gTLDs like .web unless there is a policy that gives owners of .com, .org and .net names first dibs. Otherwise the cybersquatting problem will be multiplied by a factor of 10."

The ICANN board is expected to vote in favor of moving forward with new gTLDs at the Cairo meeting, but the details will be debated for months. Observers say the earliest ICANN's board might approve a comprehensive gTLD strategy would be at its July meeting in Japan. ◪

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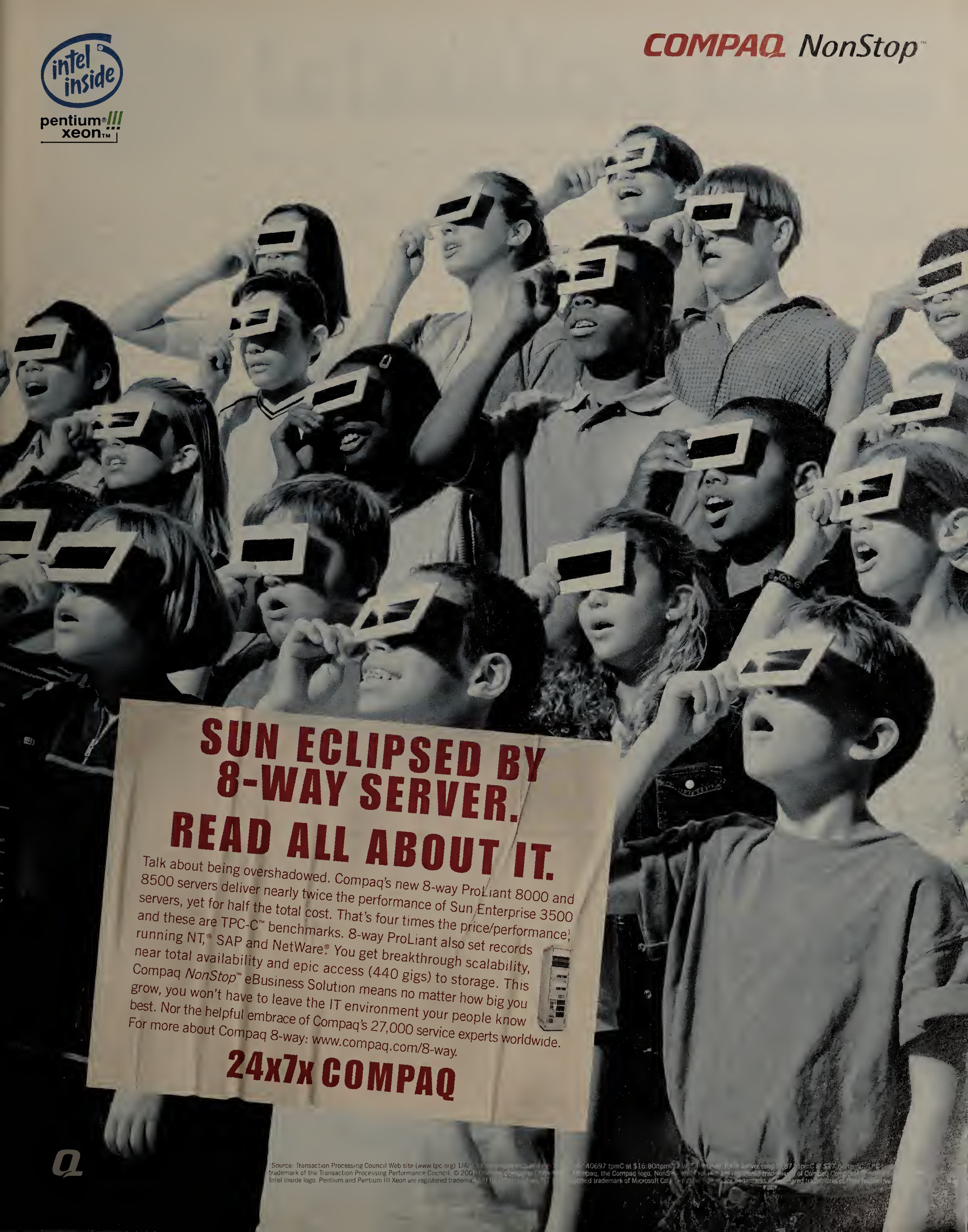
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New wave rolls over metropolitan fiber nets

BY TIM GREENE

BALTIMORE — Announcements expected at the Optical Fiber Conference 2000 this week indicate it may be time to think about Gigabit Ethernet services between campus sites in the same metropolitan area.

Vendors are introducing carrier equipment they say can make it affordable for customers to buy up to 2.5G bit/sec services over metropolitan area fiber networks. For example, one vendor claims its gear could support a 100M bit/sec service for the price of a traditional 1.5M bit/sec T-1.

The new equipment from the likes of start-ups Astral Point and Chromatis, as well as Ericsson and other larger companies, introduces wave division multiplexing to metropolitan networks, which costs less than long-haul dense wave division multiplexing (DWDM). The technology puts multiple wavelengths of light onto a single fiber, boosting the capacity of the fiber by 2.5G bit/sec per wavelength.

That means an abundance of metropolitan bandwidth, which should translate into lower prices, says Raymond Keneipp, an analyst with The Burton Group in Charlottesville, Va. That extra capacity will also be used more efficiently than on traditional SONET rings because the new gear can cram more data on a wavelength with less overhead than SONET, he says. Most of the products being introduced are expected to ship later this year, and Keneipp says carriers could be offering services based on those products before year-end.

The new equipment integrates aggregation switches with the optical gear, making it easier for carriers to set up the connections customers want, says Scott Clavenna, principal analyst with Pioneer Consulting in Cambridge, Mass. "This speeds the introduction of distributed LAN services," he says.

Start-up Astral Point is introducing ON 5000, aggregation gear that connects lower-speed networks to optical links. ON 5000 can be fitted with hardware modules with ports as slow as T-1 ranging up to OC-48 that customers can plug into. The equipment can aggregate that traffic onto an OC-48 wavelength of light that travels across the metropolitan network.

If one fiber connection fails, ON 5000 can reroute traffic to another fiber with the resiliency of SONET, Astral Point says. Each ON 5000 node can handle up to 32 wavelengths of light per fiber. Once the equipment is connected to a fiber, filters can be added so it can remove and add wavelengths without disrupting existing services, the company says.

Chromatis, another start-up, is introducing Metropolis 2000, its local optical node that supports SONET, time division multiplexing and IP services. Metropolis 2000 can handle up to 32 wavelengths, but can be configured to handle just one 2.5G bit/sec OC-48, eliminating costly WDM components. That WDM equipment can be added later as needed. Service providers using Metropolis 2000s in office buildings could charge the cost of a T-1 for 100M bit/sec Internet access pipes and still turn a profit, Chromatis says. ◪

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Briefs

Cabletron has announced a partnership with **Siemens Information** and Siemens' Communication Networks Group to integrate and market Enterprise IP, a new line of communication products.

The companies will package Siemens' HiNet Xpress multimedia communication software, IP telephones, IP gateways and IP terminal adapters with Cabletron's SmartSwitch Router and SmartSwitches, and Spectrum management software.

The companies will then jointly market these IP telephony systems to customers building e-commerce business operations.

By endorsing Cabletron's convergence products and strategy, the German telecom giant is further distancing itself from 3Com, with which it had a similar arrangement that was to blossom into a new, jointly staffed firm focused on IP telephony.

Plans for that company were subsequently scrapped, and the relationship between Siemens and 3Com has gone silent.

Broadcom last week bought **Digital Furnace Corp.** for $136 million in stock that will give the communications chip maker software to turbocharge its cable modems.

The big prize from the deal is Digital Furnace's software called Propane, which provides an upgrade to the DOCSIS 1.1 cable standard and promises to boost data throughput to more than three times current DOCSIS modem levels.

Broadcom intends to run Propane on its cable modem chips. Broadcom is also planning to develop similar software for wireless Internet access and digital subscriber line modems.

Broadcom: www.broadcom.com

New HP servers take aim at large users

LH 6000 and LT 6000r boxes beat four-way servers and near eight-way processors in performance.

BY APRIL JACOBS

Targeting large end users and Web server farm customers, Hewlett-Packard last week introduced two six-processor servers for its NetServer family that pack more performance and use less space than traditional four-way servers.

To sweeten the package, HP will refund the cost — about $5,000 — of two processors when customers buy the six-processor NetServer LT 6000r or LH 6000 boxes between March and June. A typical configuration with the rebate costs about $25,000. For processor-hungry and cost-conscious corporate users, as well as service providers, HP is touting benchmark results that show the Pentium III Xeon-based rack-mount LT 6000r and stand-alone LH 6000 servers perform at 94% of a standard eight-way server for at least half the cost, which can be well over $50,000.

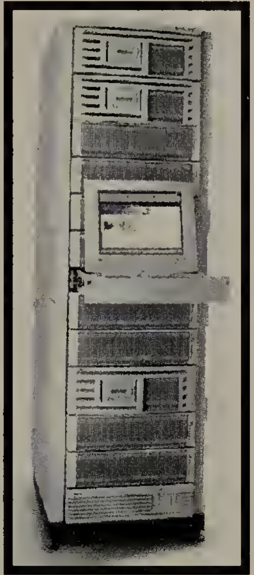
Extra features

The new servers come with network and server management tools, as well as a PCI RAID controller that HP typically retails as a premium stand-alone option for about $2,000. Both also feature HP's Remote Assistant, which allows network managers to perform diagnostic and configuration tasks from any device with a browser using the server's IP address. An optional $500 remote control card extends those features, plus access to HP's TopTools server management software to any device on the LAN, letting network managers have roving access to servers.

HP needs to have offerings that specifically address the Internet and e-commerce markets to compete in those areas rather than taking a general approach, given the market's competitive atmosphere, says Esmerelda Silva, an analyst with research firm IDC in Framingham, Mass. She notes that companies such as Dell have moved very aggressively to market products that are aimed directly at ISPs or end users with e-commerce sites.

Eye on space

Stephen Ippoliti, senior e-commerce strategist at Qwest Internet Solutions, says his company is eyeing the LT 6000r for use as a database server for online retail customers. Qwest offers a turnkey package for retailers that allows them to put their wares online in six to eight weeks using Qwest's Web site design and technical setup services.



HP says its NetServer LH 6000 will give users more processing power for less money.

"Space is money in our business, and we have to standardize on the servers we use, and the LT 6000r is cheaper than other four-ways and provides enhanced scalability with the same rack-space footprint," Ippoliti says.

The LH 6000 provides for up to six Intel Pentium III Xeon processors, 8G bytes of memory, eight 64-bit I/O slots, and up to 12 internal Ultra SCSI drives. Customers who have purchased NetServer LH 3000 servers can upgrade to an LH 6000 by changing the CPU motherboard and adding an additional power supply.

The company will continue to sell the four-way LH 4000 to customers who want it. The LT 6000r has a similar set of features but is a rack-mount version. The LT 6000r also allows for external storage for storage-area networks and clustering. Both also come standard with 10/100T X integrated network interface cards, and both will use the ServerWorks chipset.

IDC estimates that four-way server shipments will more than double over the next two years, growing from 258,000 in 2000 to 641,000 in 2002.

HP: www.hp.com

Cabletron officially unveils Internetworking plan

Familiar-sounding WAN convergence strategy emphasizes PBX augmentation, not replacement.

BY JIM DUFFY

ROCHESTER, N.H. — Cabletron's recently announced convergence strategy varies little from the plans outlined by senior executives last fall.

Cabletron divulged its Inherent Internetworking convergence blueprint at the CeBit 2000 show in Hannover, Germany, last week. The strategy is intended to provide enterprises with a migration path to standards-based, multiservice networks that merge voice, data and video.

Like the plan outlined by Cabletron executives last fall, Inherent Internetworking focuses on WAN convergence, PBX augmentation — as opposed to replacement — and building "basic" voice networks. The strategy builds upon the Layer 3 to Layer 4 switching capabilities of Cabletron's SmartSwitch Router, the management features of its Spectrum software, a voice-over-IP gateway and the company's professional services offerings.

Cabletron's differentiator is that features such as quality of service, prioritization, bandwidth management and

See **Cabletron**, page 20

CONVERGENCE CALLING
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IN-SITE: *Lessons from Leading Users*

QuikOrder brings Domino's pizza to you in 30 minutes or less

BY DENI CONNOR

You know you get cranky when your pizza isn't delivered on time — Domino's does too. That's why when the company decided to take pizza orders online, it brought in a fault-tolerant ordering system that keeps servers up and pizza orders flowing.

The pizza company is so convinced online services are the way to go, it expects that 50% of its business will be conducted over the Internet or interactive TV — such as WebTV — in the next five years, says Glen Mueller, president of Domino's franchisee RPM Pizza in Gulfport, Miss.

To prepare for that growth, individual Domino's franchises are contracting with QuikOrder, an e-commerce service provider in Chicago. In the eight months QuikOrder has been taking orders for Domino's, it has logged more than 10,000 orders. When the project is complete, over 300 stores in 15 states will use the online system. In Mueller's case, he is installing QuikOrder software in 160 stores.

QuikOrder, which supplies the e-commerce software, installed a fault-tolerant cluster called the Endurance 4000 from Marathon Technologies in its Chicago headquarters to keep its servers functioning 24-7. "The competition to online ordering is people ordering over the phone," says Ray Anderson, president of QuikOrder. "We wanted dial-tone reliability, just like the telephone company offers. We can't have any downtime. In fact, if a user was on the system and something failed, we wouldn't want the user to know it."

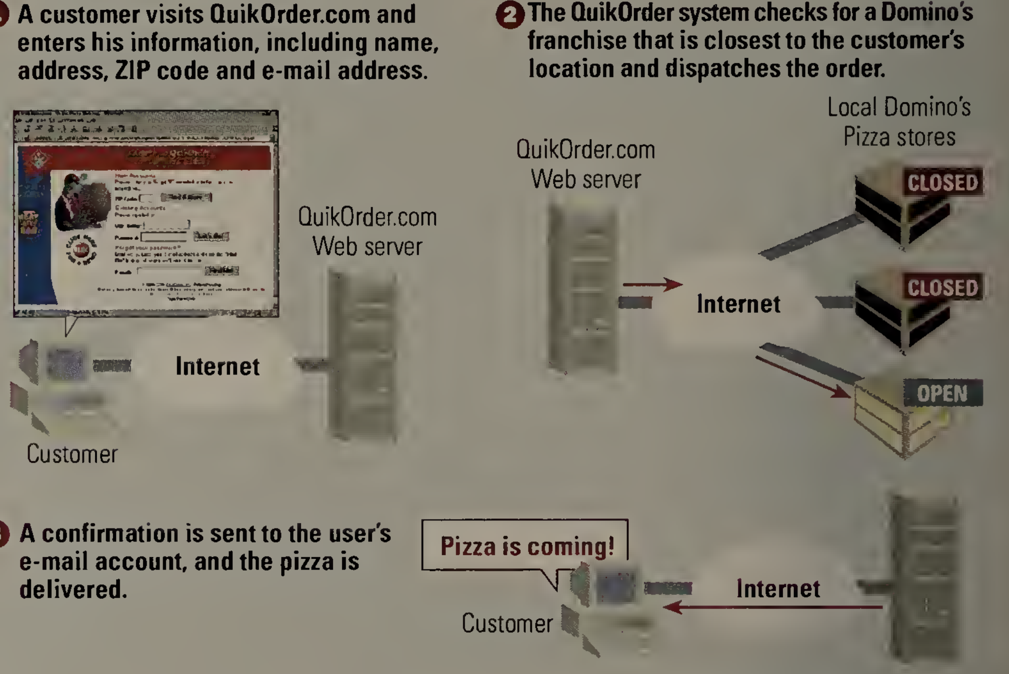
When a customer visits the quikorder.com site, he enters his zip code, name, address, e-mail or ICQ address, and other pertinent information. If the store is open, he orders the pizza he wants. If the store is closed, he will be directed to check back later. Comments, such as "Watch out for hungry pit bull," or "Deliver to pool in backyard" can be added to the order, and the system will tell the customer how long delivery will take or when his carry-out will be ready.

The QuikOrder system automatically dispatches the order to the closest Domino's store. Domino's sends a confirmation to the user's e-mail. Pizza reorders take less that 30 seconds because information is saved about each customer in QuikOrder's system.

QuikOrder's online delivery system runs on four Pentium II 400-MHz Windows NT servers connected to each other via Gigabit Ethernet links. Two servers act as compute servers that handle application processing; the other two handle I/O for the system and share a storage subsystem.

Hot and fresh content delivery

QuikOrder.com lets users order Domino's online and finds the closest store to the customer for fast delivery.



❶ A customer visits QuikOrder.com and enters his information, including name, address, ZIP code and e-mail address.

❷ The QuikOrder system checks for a Domino's franchise that is closest to the customer's location and dispatches the order.

❸ A confirmation is sent to the user's e-mail account, and the pizza is delivered.

The two compute servers run Marathon software, which sends data to and receives data from both compute servers simultaneously, and synchronizes operations so the pizza-ordering application runs in lockstep fashion across the servers. Data is written to the disks on each server or mirrored, thereby providing redundant backup for the entire system. The I/O processors (IOP) handle processing with peripherals such as disk drives and printers.

Each compute server is paired with an IOP. If a component in a compute element or IOP fails or if the pair fails, the other pair continues processing.

"We've been operational for eight months with not a minute of downtime," Anderson says. "Every minute of downtime is a potential lost pizza order." ◪

Cabletron,

continued from page 17

accounting are baked into hardware, whereas Cisco, Lucent and Nortel Networks rely on software for these functions, claims Ray Wright, Cabletron's senior director of voice and convergence solutions.

The WAN convergence piece hinges on Cabletron's SmartVoice Gateway. This device, which scales from four analog ports to 960 voice/fax channels, allows integration of existing PBXs, key systems and additional voice switches onto data networks. The gateway lets users reduce telecommunications costs via toll bypass of domestic and international voice/fax calls, Cabletron says.

The PBX augmentation plan is designed to let customers extend their current voice networks to smaller sites supporting a reduced number of users. To do this, Cabletron in the third quarter will release "soft-PBX" features on a telephony server. This server will handle call signaling for voice traffic that switches across the data network.

For "basic" voice networks, Cabletron claims its existing SmartSwitches and SmartSwitch Routers can transport all voice traffic across a data network without the need for a PBX or key system. This method is designed for small and midsize businesses requiring only limited voice connections and services.

Coming soon

As for new products, Cabletron plans to unveil an H.323 gatekeeper in the second quarter. This will enable users to establish H.323 domains in which the gatekeeper determines who can access a specific voice-over-IP gateway.

Also in the second quarter, Cabletron will roll out a public network voice gateway for service providers. It will support Signaling System 7, and voice service billing and accounting capabilities.

In the third quarter, Cabletron will add Web-based call center support to its existing Web-hosting products.

Missing from the Cabletron strategy are applications for converged networks, such as unified messaging and customer relationship management. Wright says Cabletron is looking to partner with software vendors developing these applications.

He also says a "key" to Cabletron's IP telephony application portfolio is the openness of the company's telephony server platform. An open interface will make it easier for software vendors to write several telephony applications to the Cabletron server, he says.

Cabletron may offer this API on its Web site, Wright says. This method was successful in getting software vendors to write applications to the company's Spectrum flow accounting protocol API over the past year, he says.

This API enables users to track application flows so they can bill company departments for network usage. ◪

The Cabletron plan

Some upcoming IP convergence products from Cabletron:

- H.323 gatekeeper — Q2, 2000.
- Public network Signaling System 7 voice gateway that supports billing and accounting — Q2, 2000.
- Soft-PBX products for legacy PBX extension to new sites and distributed users — Q3, 2000.
- Support for Web-based call centers to complement existing Web-hosting offerings — Q3, 2000.

Does the fact that technology keeps improving fascinate you?
Or frustrate you?

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Read on to see how MCI WorldCom used Voice over Frame technology to help an insurance company save money.

It seems every three months there's a new "killer app." The media heralds it. Startups sell it. And you lie awake at night wondering if you should buy it.

Case in point. An insurance company was hearing a lot of good things about Voice over IP technology. About how it could help their branch offices communicate with their home office for a fraction of the cost.

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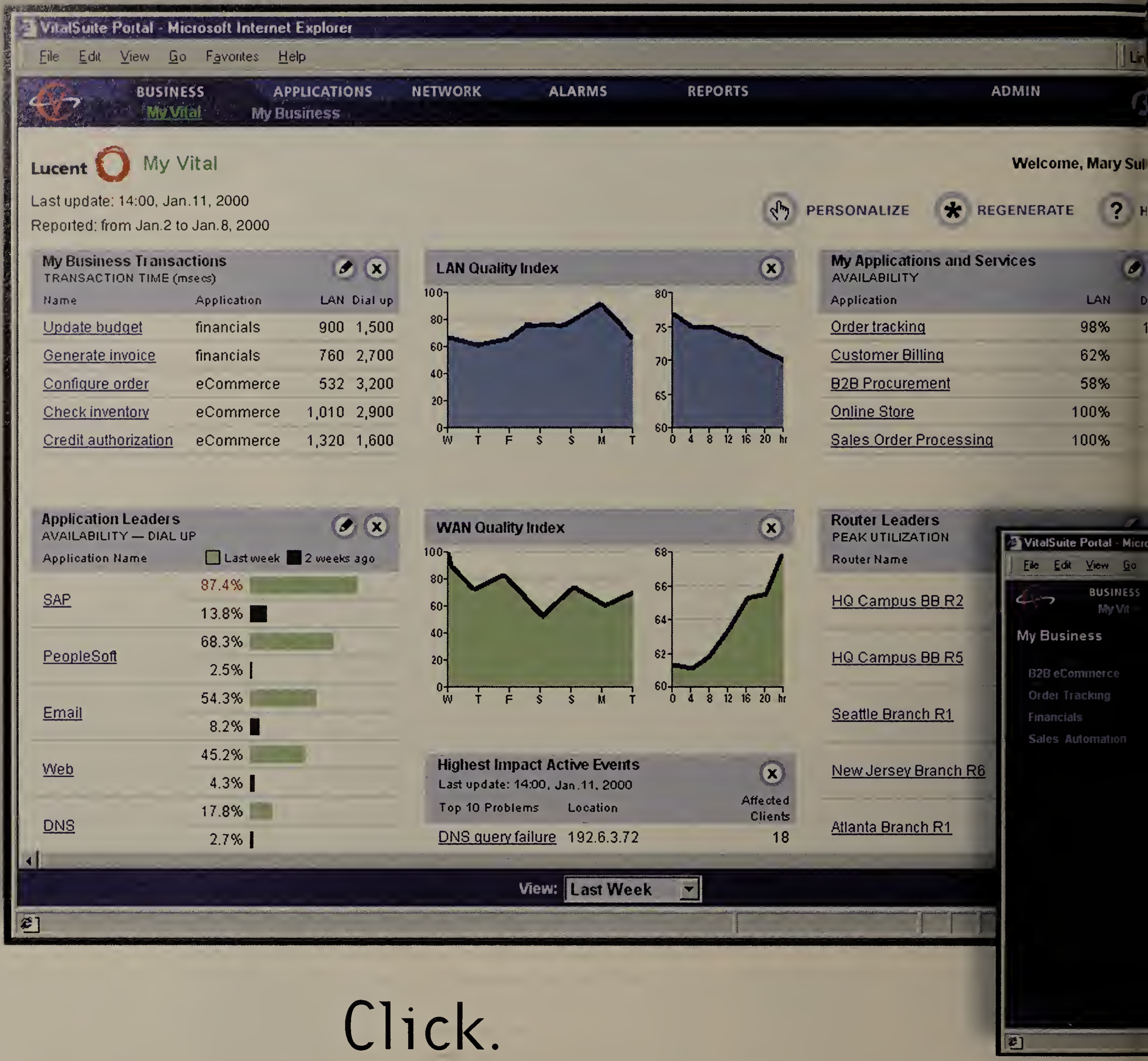

Lucent My Vital

Welcome, Mary Sul

Last update: 14:00, Jan.11, 2000
Reported: from Jan.2 to Jan.8, 2000

My Business Transactions
TRANSACTION TIME (msecs)

Name	Application	LAN	Dial up
Update budget	financials	900	1,500
Generate invoice	financials	760	2,700
Configure order	eCommerce	532	3,200
Check inventory	eCommerce	1,010	2,900
Credit authorization	eCommerce	1,320	1,600

LAN Quality Index

My Applications and Services
AVAILABILITY

Application	LAN
Order tracking	98%
Customer Billing	62%
B2B Procurement	58%
Online Store	100%
Sales Order Processing	100%

Application Leaders
AVAILABILITY — DIAL UP

Application Name	☐ Last week ■ 2 weeks ago
SAP	87.4% 13.8%
PeopleSoft	68.3% 2.5%
Email	54.3% 8.2%
Web	45.2% 4.3%
DNS	17.8% 2.7%

WAN Quality Index

Highest Impact Active Events
Last update: 14:00, Jan.11, 2000

Top 10 Problems	Location	Affected Clients
DNS query failure	192.6.3.72	18

Router Leaders
PEAK UTILIZATION

Router Name
HQ Campus BB R2
HQ Campus BB R5
Seattle Branch R1
New Jersey Branch R6
Atlanta Branch R1

View: Last Week

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STAY AHEAD OF IP TELEPHONY HYPE

In the race to understand IP telephony, it is critical that net professionals' knowledge remain ahead of vendor hype. The last thing we need is vendors telling us how to define and evaluate new technology. For most, that means opening up the black box known as the PBX, understanding traffic characteristics of packet voice and taking a first look at unifying directory, voice and e-mail systems.

I find it strange that the people who brought us plain old telephone service (POTS) had to call corporate phone systems a Private Branch Exchange. These devices are changing so much today that I propose we give them a new name. I call them modular, open phone systems, or MOPS, for short.

Vendors are deconstructing the black-box PBXs and reimplementing the features almost helter-skelter across varying combinations of open and closed hardware and software platforms. Network managers immediately need to understand the critical elements that comprise MOPS and begin understanding the finer points of each.

For example, you'll find three vendors that refer to their systems as NT-based. While that statement would lead one to believe that the systems are directly comparable, that is hardly the case. One might have all the phone system hardware and call-processing logic built into a stand-alone (proprietary) box and simply use NT for system configuration and user administration. The next might have the phone hardware implemented as PCI boards that slot into the NT server and all call-processing functions implemented as NT services. A third might have all its phone hardware and processing logic built into a PCI board that simply resides in an NT Server and draws power from the bus — not relying at all on NT for any services.

Each of these can technically be called NT-based, but each will have radically different dependencies on NT. More importantly, the fault tolerance (or lack thereof) of NT has a dramatically different effect on each.

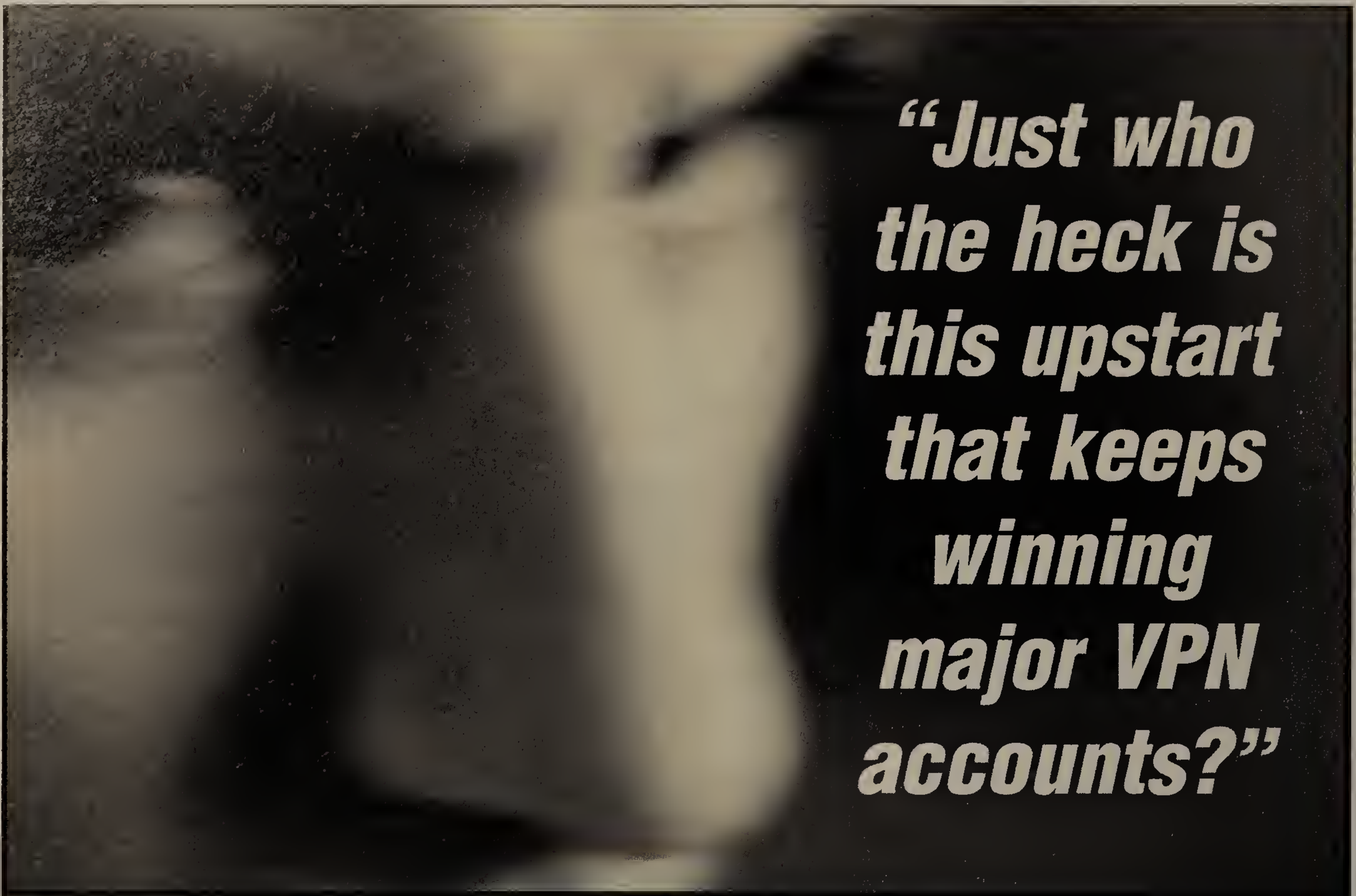
With the addition of real-time voice traffic, designers will need to take a much closer look at the impact of device and network latency on audio quality as well as the impact of data traffic spikes (congestion) on the conversation. While this will be more of an issue on the WAN, it cannot be ignored on the LAN.

Finally, net managers will have to start looking at what I call "back-end convergence" — the linking of directories and deliverables of voice and data systems.

Called unified messaging by many vendors, it covers advances such as letting your phone system access your NT user directory instead of maintaining its own, duplicate directory of users. Equally interesting is the move by some vendors to deliver your voice mail as e-mail-attached .WAV files. Nice thought, but who wants to download a dozen or more huge audio files when checking e-mail from a 56K bit/sec hotel dial-up connection?

Where this back-end convergence makes sense, net professionals have to make sure that they are not locking themselves into proprietary links.

Tolly is president of The Tolly Group, a strategic consulting and independent testing firm in Manasquan, N.J. He can be reached at ktolly@tolly.com or www.tolly.com.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Option ① SCOLDING

Inexplicably, raising one's voice is one of the most popular control tactics used by IT professionals. The drawback is, if you're not there to scold it, a server can easily turn into some sort of demon-child. As they say, when the cat's away, the servers throw a kegger. You may need remote server control. (See option 3.)

Option ② SPANKING

Taking intimidation to a new level, IT professionals have learned that a swift smack to a server's soft side can indeed get results. However, it's tough to phone-in a spanking from the road. A defiant server will simply laugh and laugh, forcing you to drive to work and slap some sense into it.

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Carriers & ISPs

The Internet, Extranets, Interexchange and Local Carriers, Wireless, Regulatory Affairs

Briefs

Growing data carrier **Intermedia Communications** has inked a deal to offer international carrier **Infonet's** Global Frame Relay service under the Intermedia brand. Infonet offers frame relay to 45 countries. Intermedia, originally an alternative local carrier with regional connections in the Southeast, has branched out to many areas of the country and has added Internet access, Web hosting and shared-tenant integrated-access services to its portfolio.

Intermedia: www.intermedia.com

PSINet is rolling out **Tiara Networks'** Series 7000 Frame Switch throughout its point-of-presence sites in the U.S. PSINet plans to use the devices to offer dedicated-access service options that include bundling multiple T-1 connections for customers who need more bandwidth but aren't ready to upgrade to a T-3 pipe. The Tiara gear will allow PSINet to offer higher-speed IP-over-frame-relay services to business users. PSINet also will be using Tiara's Series 1000 customer-premise devices to support some of its Internet services.

PSINet: www.psi.net

Cidera and **Microsoft** have teamed to make Windows Media Technology more scalable by using satellite networks for streaming audio and video to the edge of the network. Cidera modified the Windows Media protocol so that it no longer relies on a two-way terrestrial connection. The modified protocol can be more easily streamed across Cidera's satellite network to ISPs and other content aggregators.

Cidera: www.cidera.com

Teligent's Mandl sizes up a tough market

NetworkWorld Q&A

Teligent, a national facilities-based competitive local exchange carrier (CLEC), launched its first offerings just 16 months ago with Chairman and CEO Alex Mandl at the helm. Mandl started Teligent in 1996 after a five-year stint with AT&T, where he served as president and chief operating officer. Today, Teligent offers service in 40 markets and has more than 10,000 customers. Mandl recently talked with Network World *Senior Editor Denise Pappalardo and Editor in Chief John Dix about what it takes to be competitive in today's vibrant market.*

How do you view the competitive landscape? Are the CLECs starting to bump into each other?

We can't lose sight of the fact that 95%-plus of all local voice services are still served by monopoly companies. Even though there are a lot of CLECs, the revenue from these companies only amounts to a tiny percentage of the overall opportunity. There is plenty of room for companies to grow and go after the regional Bell operating companies' very large slice of the local services business. I would not describe the field as overly crowded.

Given the number of new players, are we ultimately looking at a shakeout?

There is no question the industry will continue to consolidate in a fairly aggressive way. I think you'll see consolidation among the CLECs themselves, just by virtue of the need to build critical mass and to accelerate growth. And I think there will be activity between the CLECs and the major carriers. Over the next five years or so you'll see continuous partnering, merging and acquiring activity as the various companies position themselves.

Cost is one of Teligent's advantages. What can users expect?

For the most part, customers will pay 30% less than what they are paying today for local voice and Internet access. Long-distance has a slightly different structure, but again it's a competitive discount.

> **"As voice becomes part of the digital stream, it will be priced differently, and it will be harder to measure the future growth of voice using traditional voice metrics."**
>
> Alex Mandl, chairman and CEO, Teligent

Do you sell mostly based on price?

Price gets you in the door and gets the customers' attention. But what keeps the customer and allows you to grow with the customer are things such as value-added services, high-quality customer care and providing the bandwidth capabilities that the customers are not getting today.

Eighty to 85% of your revenue is still from voice. Are you one of those who believes someday voice will be free?

There are very few things that are free. It might become less expensive, but it's not going to be free. As voice becomes part of the digital stream, it will be priced differently, and it will be harder to measure the future growth of voice using traditional voice metrics.

Is Teligent testing or using any voice-over-IP technology?

We're doing some testing. Our main architecture is ATM today, but we are building our own ISP network. As we continue to build that out, voice over IP will be part of the consideration.

Do you think voice over IP is the future?

If you ask will it be all voice over IP in the next three years, I don't believe that. But in seven to 10 years, the odds are that a high percentage of voice traffic will travel over IP.

When do you hope to have all of your customers on Teligent's own Internet backbone?

Roughly by mid-June, at the latest.

Teligent got a cash infusion from Microsoft last year. Does the relationship go beyond that?

It does. Microsoft has made these types of investments in a number of companies. Basically they hope their investment makes money, and so far it certainly has. But as part of the investment, Microsoft is looking for partnership opportunities that will allow us to leverage each other's capabilities. We're still defining and working through that, but basically it means we can either cross-sell or we can bundle certain Microsoft software with our services. There is an array of opportunities.

Where does Teligent draw the line between being a carrier and an application service provider (ASP)?

There is not a sharp line there. But the more value-added services you offer, such as Web-based services, the stronger the relationship with your customer. Our strategy is one of moving up the value chain.

Where will you stop? Will you become a full-fledged ASP or simply offer services that are close to your core competencies?

We'll have to see how we can best serve our customers. You want to walk before you run. Clearly, providing a core set of application services is where we would start. That will be done through partnerships, maybe some acquisitions, and through some of our own internal development. ◪

www.nwfusion.com

MORE FROM MANDL

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The state of broadband technologies.

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Eye on the carriers . David Rohde

SHAKING DOWN TELECOM MERGER APPLICANTS

None of the fights and accusations you've seen between George W. Bush and John McCain quite compare to a tussle going on between the chairman of the Federal Communications Commission and his congressional tormentors.

Has either Bush or McCain accused the other of "blackmail," "shakedowns" or "abetting corruption"? Those are just some of the charges in a war between FCC Chairman William Kennard and Billy Tauzin, a Louisiana Republican who heads the House subcommittee that oversees the FCC.

And this is a fight with a big impact on you because it could help determine whether you will have to continue to contend with consolidation among the leading carriers.

The root of the controversy is that Tauzin and some other congressmen don't care for the way Kennard has been handling telecom mergers. Never mind that the congressional critics come from two opposite camps. Some believe the FCC should butt out of merger reviews and let the Justice Department decide. Others think the FCC should start rejecting these deals as anticompetitive and anticonsumer.

What neither group likes is the FCC's habit of approving mergers with conditions committing the merged company to socially aware actions of dubious legal standing. These include promises to put more broadband facilities in underserved areas or take some other action attacking the alleged Digital Divide between (take your pick) rich and poor, black and white, young and old, or urban and rural.

This practice has become so ingrained at the FCC that even non-merger applicants have learned to pay homage to the Digital Divide. Wireless and broadcast players with major license issues before the FCC often seem to make big contributions to schools and libraries just as their requests are put to a vote.

Tauzin thinks this is a bogus way to run an agency that's supposed to carry out the laws. He's been claiming that the FCC demands these concessions as a form of shakedown or blackmail. And that's something no self-respecting FCC chairman can abide.

"It is unfair, irresponsible and unworthy of a public official for you to cast aspersions on the integrity of the FCC in this manner without citing facts or examples of any such conduct," Kennard wrote Tauzin.

Maybe so. But Kennard must know that every big local, long-distance, cable and wireless carrier has a lobbying staff capable of making it look like the company is attacking the Digital Divide. Is there any doubt that potential approvals of the Bell Atlantic/GTE, MCI WorldCom/Sprint and AOL/Time Warner mergers will come with a set of letters committing the company to do good things for America?

Of course there isn't. So what happens if the Digital Divide is still standing after three more megamergers? Or is it possible that the best way to get big companies to bring benefits to everyone is to get their focus back on technology and away from mergers — maybe even turn one of these mergers down? Let me know what you think.

Rohde is a senior editor with Network World. *He can be reached at drohde@nww.com.*

Verilink to introduce new IADs

Company releases WANsuite family of integrated access devices.

BY DAVID ROHDE

MADISON, ALA. — A long-time supplier of frame relay devices and DSU/CSUs has introduced a line of economical integrated-access devices designed to let an enterprise attach different-sized sites to a variety of high-speed carrier services, including robust new digital subscriber line (DSL) options.

The new WANsuite family from Verilink is a set of concentrators for voice, data and Internet traffic ranging from those designed for small, fractional T-1 sites to ones that want to take advantage of the new high-bit-rate digital subscriber line, two-wire (HDSL2) standard. HDSL2 is a two-wire equivalent of T-1 over copper.

HDSL2, which runs over two wires instead of the four ordinarily required for T-1, is expected to be used by DSL carriers as a way to provide symmetrical T-1 service at about 40% below typical Bell T-1 prices. Verilink says it won't release the product before a final standard is ready.

Though Verilink hasn't announced any carrier agreements for the product line yet, WANsuite is expected to form the customer premises equipment component of upcoming carrier integrated-access services.

The boxes also will be available directly to enterprises setting up widespread converged networks of their own.

The first two boxes, scheduled to be available later this month, are the WANsuite 5130 and 5160.

WANsuite 5130, with a list price of $1,295 per unit, is a single-port, service-aware T-1 or fractional T-1 integrated-access device. WANsuite 5160, priced at $1,695, adds a DSX-1 port.

In May, Verilink will add a smaller box for a single 56/64K bit/sec connection at $995, plus a product for E-1 connections commonly found in Europe.

Expected during the summer is a product called WANsuite DSL, which connects to HDSL2 WAN interfaces.

A major pitch for the new devices will be their ability to collect data about traffic throughput differentiated by type of service and protocol in 96 consecutive 15-minute intervals. That way users — including those who buy managed integrated-access services — can have a way to check the network's performance against their carrier's service-level agreement.

Verilink: www.verilink.com

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Managed VPN services gain users, new wrinkles

BY DENISE PAPPALARDO

Managed virtual private network services may not be generating the industry buzz they once did, but businesses are indeed tapping into these services for inexpensive, secure dial-up and dedicated connectivity.

MANAGED VPNS

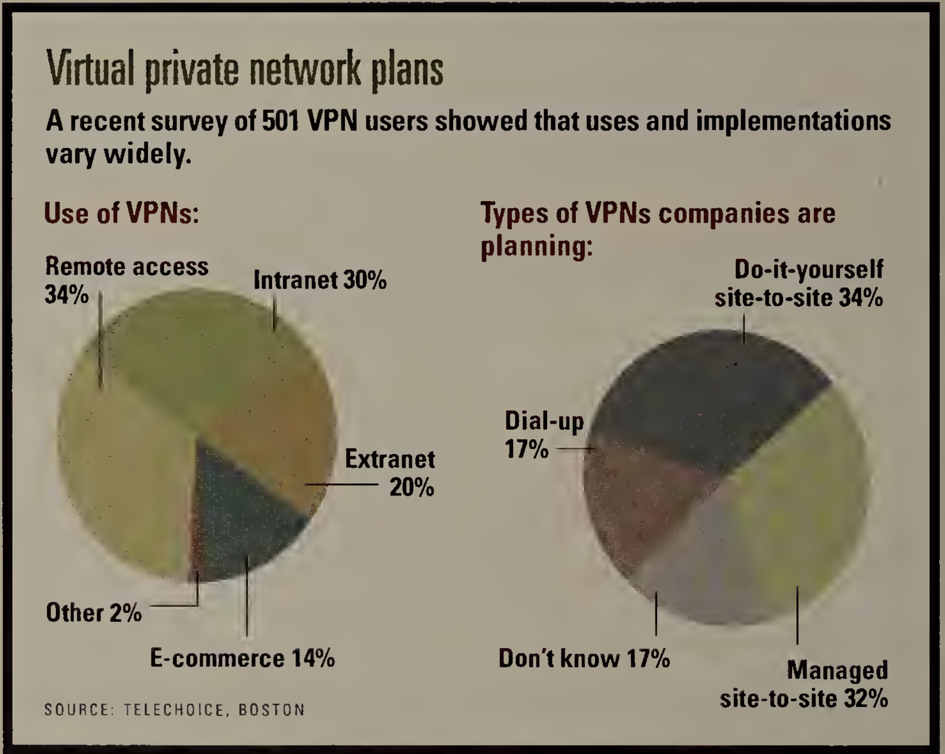
Businesses are tapping into these services for inexpensive, secure dial-up and dedicated connectivity.

"Managed VPN services are going to continue to become more important to business users," says Jim Slaby, senior analyst at Giga Information Group, a Cambridge, Mass., consulting firm. "From lower costs in terms of connectivity and international reach, managed VPN services are a slam-dunk."

Among the prime reasons that businesses look to outsource any service are a lack of in-house expertise and the desire to keep IT staff free to focus on other projects. Because IP Security (IPSec) tunneling and encryption, digital certificates and public-key infrastructure (PKI) authentication are becoming staples of most VPNs, users will find security experts in even greater demand. This job-market reality is why more businesses will turn to managed VPN services, Slaby says.

But managed VPN services are not new to businesses such as Booz, Allen & Hamilton, Lord Corp. and Carbo Ceramics. While different sizes — Booz Allen employs 10,000; Lord, 2,000; and Carbo Ceramics, 200 — all use managed VPN services for cost-effective connections with expansive international reach.

Carbo Ceramics set up its Internet-based VPN two years ago with PSINet to link three remote manufacturing sites with its headquarters in Irvine, Texas. Carbo was ready to deploy a new enterprise resource planning (ERP) system called Navision but had no connectivity between sites in New Iberia, La., Eufaula, Ala., and Mcintyre, Ga., says Barney Lejeune, IT manager at Carbo. Lejeune is charged with keeping about 35 employees traveling in Asia and South America connected to the firm's VPN.


Virtual private network plans

A recent survey of 501 VPN users showed that uses and implementations vary widely.

SOURCE: TELECHOICE, BOSTON

"We didn't have time to get involved with dealing with local exchange carriers, choosing routers and DSU/CSUs," he says. "We wanted someone to provide dedicated and international dial-up Internet access and be able to manage the network for us."

Carbo talked with AT&T, MCI and Intermedia before going with PSINet. PSINet has been able to easily increase bandwidth at Carbo's manufacturing sites as well as add needed back-up systems, he says.

While pleased overall, Carbo is looking for more intuitive client software that will allow users to connect to the 'Net over a dedicated T-1 in a hotel or using a dial-up connection. The biggest problem for Carbo is that the firm's employee base is not computer-savvy and any glitches in client software cause problems for the IT staff back in the main office, Lejeune says.

Robust client software is especially important to Lord, a manufacturer of aerospace motion control devices and chemicals, because the company is only supporting dial-up users on its Internet-based VPN.

Lord stumbled into its managed VPN service while looking to replace an "expensive, unreliable and not well-supported" managed remote LAN dial service from MCI, says Tom Stribling, manager of network services at the Cary, N.C., company. Lord started talking with GTE Internetworking about that company's Dialinx IP remote access service, but because Stribling was very concerned about security, GTE Internetworking suggested its VPN Advantage offering.

Lord is supporting a dial-up VPN for about 400 of its 2,000 employees who work from small or home offices and travel the world. GTE Internetworking has the U.S. coverage that Lord needs and also offers local number dial-in support around the world.

Giga's Slaby recommends that businesses check out an ISP's domestic coverage before signing on the dotted line. Ensuring that users will be able to connect to a local point of presence will keep telecommunications costs lower and latency in check, he says.

GTE Internetworking is among the ISPs that team with global roaming-service provider iPass to offer local dial-in support in 150 countries. This means employees traveling in Sri Lanka or Brazil, for example, can connect to Lord's network for the price of a local call instead of a long-distance international call.

Lord is using both IPSec and the Layer 2 Tunneling Protocol when remote users connect to Lord's corporate net. Lord is also using standard Data Encryption Standard (DES) overseas and Triple-DES domestically. Lord is issuing digital certificates to remote users for additional user and network authentication.

Lord has TimeStep's Permit VPN device deployed to support its remote access users, but is in the process of switching to Nortel Networks' Contivity gateway. "The TimeStep device is very good, but its client is difficult to install and rather fragile," Stribling says. "If we make any changes to a system, we have to uninstall and then reinstall the TimeStep client. We haven't yet been able to break the Nortel client."

Booz, Allen & Hamilton signed up for its first managed VPN service in 1997 with UUNET, but has since swapped vendors. "UUNET understood what we were trying to get done, they had the knowledge, but they weren't good at productizing it," says Daniel Gasparro, chief technologist at the McLean, Va., management consulting firm.

Some ISPs are more concerned about selling network capacity than managing a worldwide VPN service, Gasparro says. This led Booz, Allen & Hamilton to team with Fiberlink to connect about 7,000 employees and customers worldwide to the company's networks. While UUNET probably has more international coverage than any other domestic ISP, Fiberlink is able to offer dial-up Internet access connectivity locally through iPass, which referred Booz, Allen & Hamilton to Fiberlink.

Each business has to decide what's more important for its VPN, Gasparro says. The choices are to team with an ISP that can offer high quality of service by only using its backbone or to use an ISP that allows you to use a third-party service such as iPass that provides international connectivity.

Booz, Allen & Hamilton is also looking for the flexibility to deploy other broadband services, such as digital subscriber line (DSL) and wireless services. With some ISPs, it's difficult to incorporate other service provider offerings into managed VPNs.

"What's happening now is that our user base is outpacing our ability to keep up with new developments," Gasparro says. He would like to see a centralized method for letting Booz, Allen & Hamilton employees sign up for DSL services to link to the company's VPN. This centralized method could be as easy as a secure Web site that Fiberlink would set up and manage.

Managed VPN services will continue to need technology and customer service upgrades, but there are now more service choices for users than ever before. ◪

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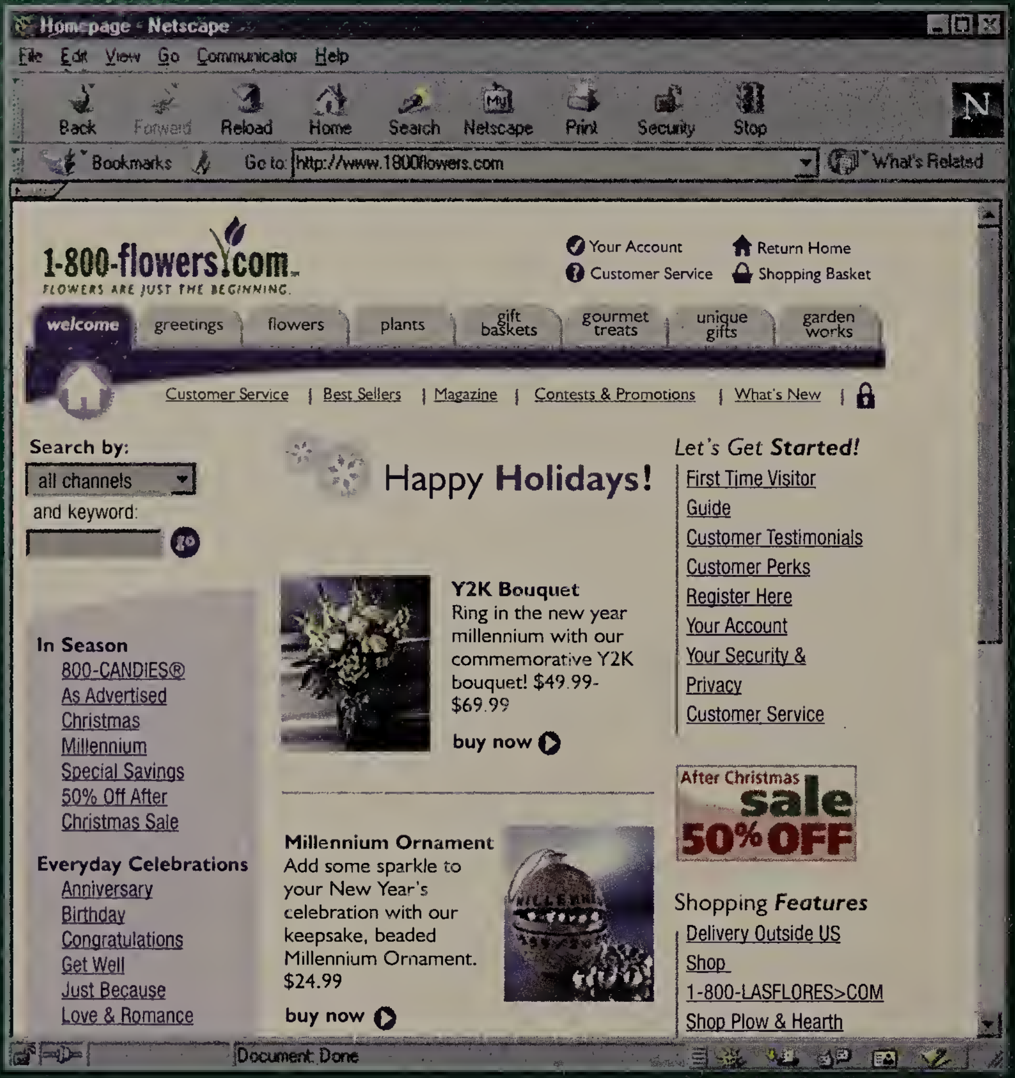
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Enterprise Applications

Intranets, Messaging/Groupware, E-commerce, Security, Network Management, Directories

Briefs

Oracle, Sears and French retailer **Carrefour** last week announced the formation of a business-to-business online purchasing exchange that they said will be the largest of its kind in the retail industry. Called the GlobalNetXchange, the online marketplace will initially serve Sears' and Carrefour's $80 billion supply-chain purchases from a combined 50,000 suppliers, partners and distributors, the companies said.

Other retailers will be invited to join the online marketplace, which is based on Oracle Exchange, the company's e-business marketplace platform. The new exchange, deploying standard Web browsers, will let members buy, sell, trade or auction goods and services over the 'Net. GlobalNetXchange will begin operations within 30 days.

OnLink, which markets Web server software that acts as a virtual sales assistant to online buyers at e-commerce sites, says it plans to ship a version of its software by midyear for business-to-business trade exchanges. The company's current software, which costs about $400,000, is limited to "single seller to multiple buyer" situations. The new version will assist a buyer in choosing items offered by multiple sellers at the same trading exchange.

Network management software vendor **RiverSoft** has received $35 million in funding from Morgan Stanley Dean Witter Private Equity and a group of partners including Cisco. The company, which sells software that pinpoints problems on IP networks, will use the new funds to expand its sales force and customer support operation. The investment will also help the company deliver a new suite of software to be detailed at a later time.

BEA preps software for e-comm battle

BY JOHN COX

The newest software from BEA Systems targets enterprise customers who know the Web makes e-commerce harder, not easier.

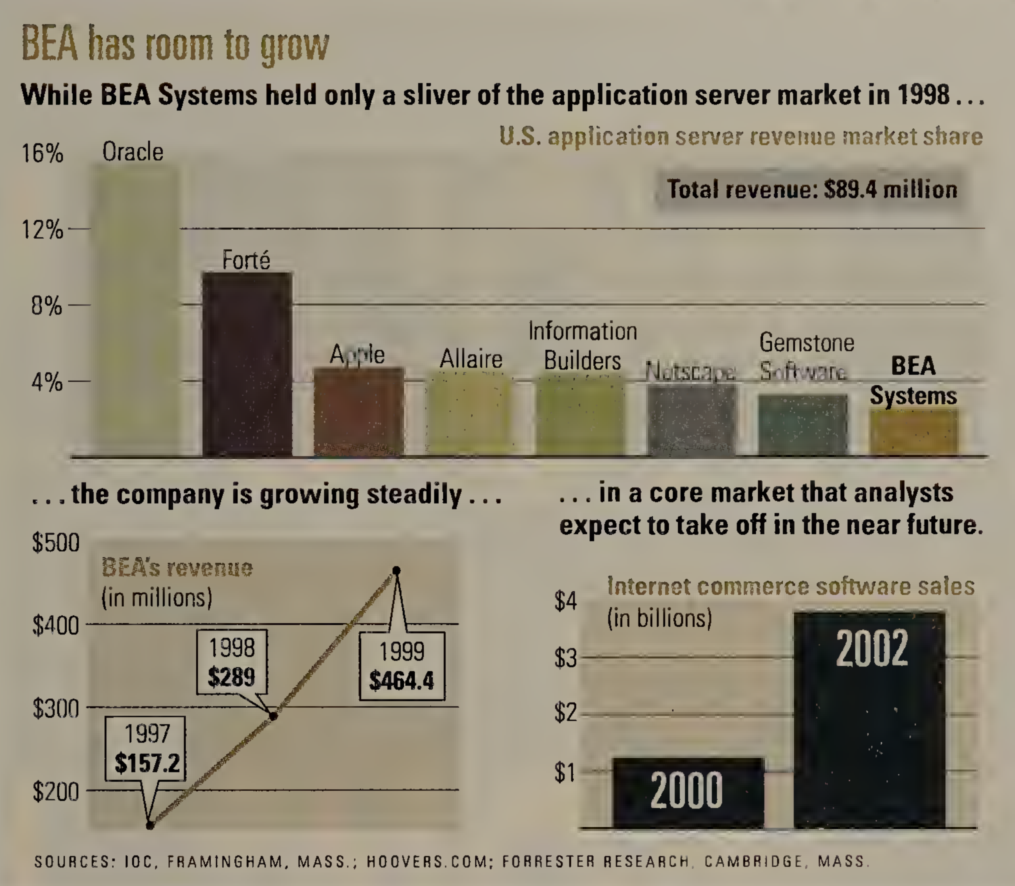
A new version of BEA's Tuxedo online transaction processor, announced in February, now manages Web documents formatted in XML, which is becoming a standard for sharing application data and includes interfaces to advanced Internet security technology. The company also introduced a new package based on the WebLogic application server designed to make it easier for enterprise users to set up a Web commerce site, with ready-to-use software components called Enterprise Java Beans.

But some customers are worried that BEA's rush to stake its claim in the exploding e-commerce market could lead to a loss of focus and weaker customer support.

Big e-commerce sites have to solve many tough problems, such as linking

See **BEA Systems**, page 36

BEA has room to grow



SOURCES: IDC, FRAMINGHAM, MASS.; HOOVERS.COM; FORRESTER RESEARCH, CAMBRIDGE, MASS.

SAS unveils Web analysis tools

Products complement company's development tools.

BY ELLEN MESSMER

CARY, N.C. — SAS Institute has introduced its first out-of-the-box programs for analyzing Web site e-commerce activity, including buying and usage trends.

The new software is a departure for SAS, which is best known for its data-mining application development tools. The company offers nearly 40 different tool sets for designing custom applications that run on mainframes and servers and that can analyze everything from network to application performance and usage.

The new packages include WebHound, which runs on any Web server and aggregates and analyzes Web activity. The company says the software can easily process data files as big as 9G bytes. The software puts SAS in competition with WebTrends and Accrue.

Also new is e-Discovery, which combines WebHound's features with the ability to take data out of IBM, Oracle and SAP data warehouses, enterprise resource planning systems, call centers and sales automation centers. It can combine information from a variety of sources to do comparative analysis.

Rounding out the new offerings is IT Services Vision, which combines WebHound's capabilities with the ability to capture data from database server logs as well as from assorted network and telephony devices. IT Services Vision lets network managers undertake a separate analysis of events or present a unified view. It runs on Unix and Windows NT.

Apex, a North Carolina Web consulting firm hired by the firm Qualex, used SAS e-Intelligence tools to create analysis programs for *The Washington Post* and *Newsweek* Web sites. Mario Perkins, principal consultant at Qualex, says WebHound will be a welcome addition because it provides a set of ready-made templates for collecting and analyzing data.

"This will allow us to deploy software more quickly for the customer," Perkins says, adding that because WebHound is extensible for use with custom code, it won't hold back developers who are interested in doing custom design.

SAS: www.sas.com

Tools for data hounds

SAS Institute's three new data-analysis product suites:

Product	Cost	Features
WebHound	$80,000	Provides analysis of Web-server activity.
IT Services Vision	$100,000	Includes WebHound, plus data mining and analysis of back-end network equipment, database server logs and telephony logs.
e-Discovery	$200,000	Includes WebHound, plus data mining and analysis of call center data collection and sales automation centers.

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NCR

Merger creates one-stop-shop for net and application monitoring software

BY MARC SONGINI

Users could now have one company to go to get their Windows NT and Windows 2000 network performance monitoring, testing and management software.

So claim executives from companies NetIQ and Mission Critical Software, which last week announced they were merging in a $2.7 billion deal. NetIQ makes application and server management software for Windows NT.

Simultaneously, Mission Critical, which provides software for directory management and administration for Windows NT-based networks, announced it was buying Ganymede Software, a maker of network performance management software for $171.2 million in stock. Products resulting from the merger should hit the market sometime this spring or summer, executives say.

The resulting company, which has yet to be named, will provide Windows NT and Windows 2000 server based networks with a wide-reaching set of administration and management tools that span the network from the server to the end user.

Mission Critical and NetIQ are strikingly similar companies with some similar products — facts that lead observers to believe some products could face extinction.

Product overlap

There is indeed management product overlap, says Philip Mendoza, an analyst at IDC, a consultancy in Framingham, Mass. For instance, both vendors have user administration tools that do some similar server and application performance monitoring — NetIQ has AppManager and Mission Critical has Operations Manager. However, the NetIQ AppManager product is older and more mature, and the Mission Critical Operation Manager tools will probably get rolled into it, Mendoza says.

But the merged firm is not planning to discontinue any products, says Rick Pleczko, vice president of marketing at Mission Critical, although there will be some integration. There are major differences between the lineups of the two companies, he says.

For instance, Mission Critical's product line is tied more closely to Microsoft's Active Directory. Moreover, there are administrative tools to ensure Active Directory is always available to the network. The tools also act as watchdog so only authorized personnel can access Active Directory and make changes, Pleczko says.

He says Mission Critical's Operation Manager product studies the event logs of NT servers and watches for problems. However, NetIQ generally works on a higher level, and monitors the specific applications on the network — particularly those that are handling e-business operations. And if a piece of software is malfunctioning, such as an e-business transaction server, then NetIQ will issue an alert or launch a script to heal the application.

Ganymede is considerably different than the other companies in that it's more focused on offering products that monitor network performance. It has two products: Chariot, which tests end-to-end network performance using agents; and Pegasus, which measures response times and throughput for network traffic and automatically sets performance thresholds.

One user who spoke on the condition of anonymity says he hopes the merger brings about more tightly integrated products. "The combination of NetIQ expertise and Mission Critical's monitoring engine will be a great combination in one product."

NetIQ: www.netiq.com

Pieces of the merger puzzle

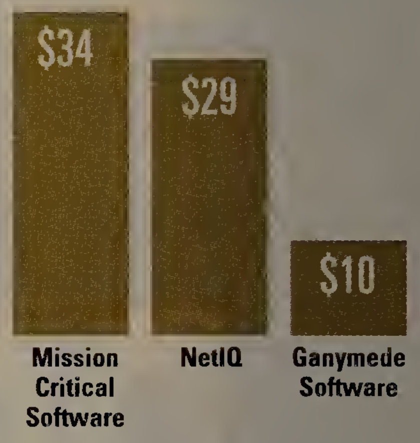
A breakdown of the three network software companies that recently joined forces:

Mission Critical Software
Headquarters: Houston
Product: Windows 2000 and Windows NT directory management software
Funding: Publicly traded

NetIQ
Headquarters: Santa Clara
Product: Management software for Windows NT and Windows 2000 applications
Funding: Publicly traded

Ganymede Software
Headquarters: Raleigh, N.C.
Product: Network performance measuring and testing software
Funding: Privately held

1999 company revenue (in millions)



The new company will be based in Santa Clara, with operations and development personnel in Houston.

SOURCE: MISSION CRITICAL, NETIQ, GANYMEDE

BEA Systems,

continued from page 33

with back-end databases, coordinating with business partners, managing high traffic volumes and keeping response times fast. BEA's Tuxedo transaction processor and WebLogic application server are intended to address those concerns.

"They're pushing so quickly into the e-commerce market, that they may ignore the core of what makes them great, which is the Tuxedo product," says Matthew Eberz, vice president of technology for ChoicePoint, Inc., an Alpharetta, Ga., company that supplies data and reports to businesses and government agencies.

ChoicePoint relies on Tuxedo to manage data requests from tens of thousands of customers, and even more in the future, as it creates Internet and intranet sites with BEA WebLogic, which will connect with the existing Tuxedo's transaction services. "Their software is extremely reliable, and they have excellent partners who can help you develop applications," Eberz says. "And BEA in the past has been very interested in working with customers on a personal basis to help you achieve your goals."

www.nwfusion.com

BUZZING BEA

Download: Financial tables outlining BEA Systems' earnings.

Spec sheet: WebLogic product line.

White paper: BEA Tuxedo E-commerce Transaction Platform.

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Judging by the company's revenue and profits, plenty of others agree. For the fiscal year ending Jan 31, revenue was $464 million, compared to $298 million the previous year, a 56% leap. BEA reported operating income of $51.4 million, compared to $22.2 million the previous year, a 131% increase.

The newest releases from BEA all demonstrate the company's focus on e-commerce. BEA Tuxedo 7.1 has new interfaces that make it easier for customers to plug in third-party security software based on public-key infrastructure encryption.

Another key change lets Tuxedo "read" the tags in documents formatted in XML. What this means, says Mark Carges, a BEA vice president, is that Tuxedo can decipher XML documents and route them to the appropriate servers or applications, just as it does other data types.

At the same time, XML documents are protected by Tuxedo's queuing mechanisms and transaction features.

Also new is a package called the WebLogic Commerce Server. This product incorporates the WebLogic application server, along with more than 80 ready-to-use Enterprise Java Beans, or software components, developed for e-commerce applications. Also included is a program that lets the Commerce Server personalize the information displayed and services accessed by users with Web browsers.

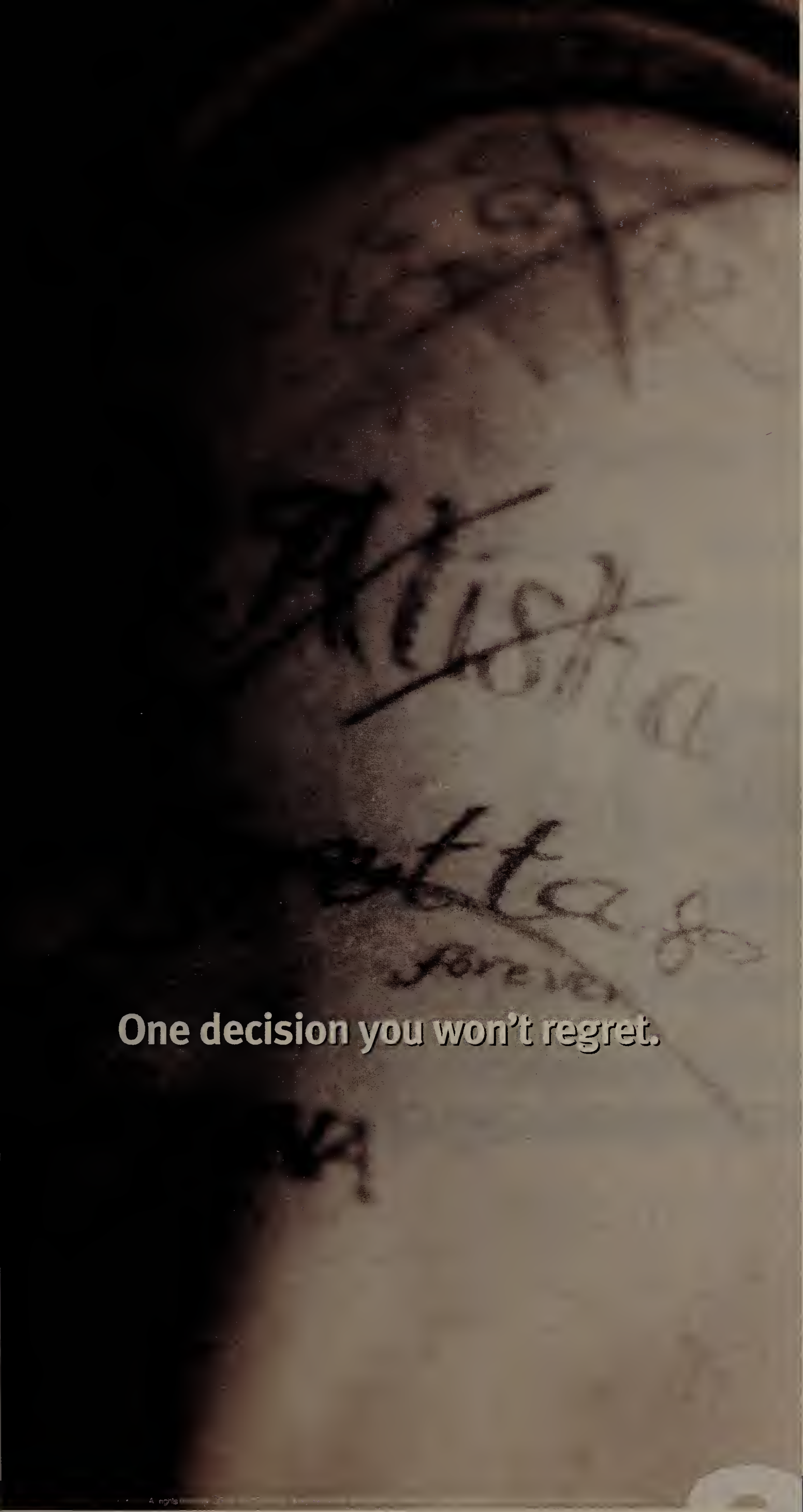
"The Commerce Server lets us use and build Enterprise Java Beans that we can deploy across many different applications," Eberz says. "And we're very interested in the personalization feature. Today, we have to clutter up the Web display so our customers can see everything we offer. In the future, they'll fill out a profile, and Commerce Server will serve up the appropriate subset of products they're interested in."

The company also unveiled an adapter kit for its eLink Integration Server, a software product that lets programs on WebLogic access data in enterprise applications such as SAP's R/3 suite. The adapter kit lets corporate IT groups build eLink interfaces to specialized or homegrown enterprise applications.

So far, BEA seems to be on the right track.

"There's a lot more in WebLogic that we're still not using yet," says Paul Friedman, chief architect at Supplybase. inc, a San Francisco software company that sells collaboration software based on BEA WebLogic. "We're interested in using the clustering feature to run on groups of servers and the Java Server Pages which create dynamic Web pages with back-end data. They're always a few steps ahead of us, which I like."

BEA: www.bea.com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'Net Insider . Scott Bradner

CONVERSATIONS IN CYBERSPACE?

I had a very interesting and philosophical conversation the other day with Kon Leong, president and CEO of ZipLip. He stopped by my office during a press tour to talk about ZipLip and its services.

Our conversation started with the normal fuzzy yet pretty pictures that press tours are built on, but it quickly shifted to the deep dilemma that confronts anyone in the anonymous communications business.

ZipLip (www.ziplip.com) is less than 2 years old and has been offering services on the Internet since July 4, 1999. Apropos of the company's public launch date, ZipLip offers secure e-mail outsourcing services to individuals and organizations. Users connect to the ZipLip site using secure Web browsers to send and receive e-mail and to transfer files. If requested, ZipLip can also "shred" (the company's word) the documents after they are read. Individuals using the service can do so with identification or anonymously.

The need for secure and destroy-after-reading e-mail in a corporate setting has been made abundantly clear in the ongoing Microsoft vs. U.S. government court case. For good, and sometimes not-so-good reasons, individuals also need secure e-mail. It is clear that people planning the next billion dollar.com company need to be sure their e-mail is secure. They may be less worried about being sure that old mail gets shredded, but they do not want outsiders listening in.

In the corporate world and for many individuals, it is important this mail not be anonymous (that is, it is important to know who sent the mail). But there are many reasons users may feel they need to send anonymous mail. People needing anonymity include those who want to interact with health resources (AIDS help centers, for example), whistle blowers (both criminal and corporate), battered women and many others. Other people might use anonymous services for very different purposes. Child pornography, hate mail, electronic stalking and terrorism are commonly cited examples.

People such as ZipLip's Kon are in a particularly tough spot. How should they act? Should they provide the ability of their users to remain anonymous, or should they insist on some type of identification from all their users? It is very easy to say anonymity on the Internet should not be allowed "for the community." But it would be just as easy to say the police should have cameras in all our houses to catch lawbreakers.

Leong can be likened to the lead character in the movie "The Conversation." He cannot ignore the evil that might be done through his services, but he must not ignore the good. In my opinion, the good outweighs the bad to such a degree that there is no question that the service should continue.

But that is easy for me, who does not run such a service, to say.

Disclaimer: Folks at the Harvard Law School will argue both sides of this question (sometimes at the same time). But the above comments are mine alone.

Bradner is a consultant with Harvard University's University Information Systems. He can be reached at sob@sobco.com.

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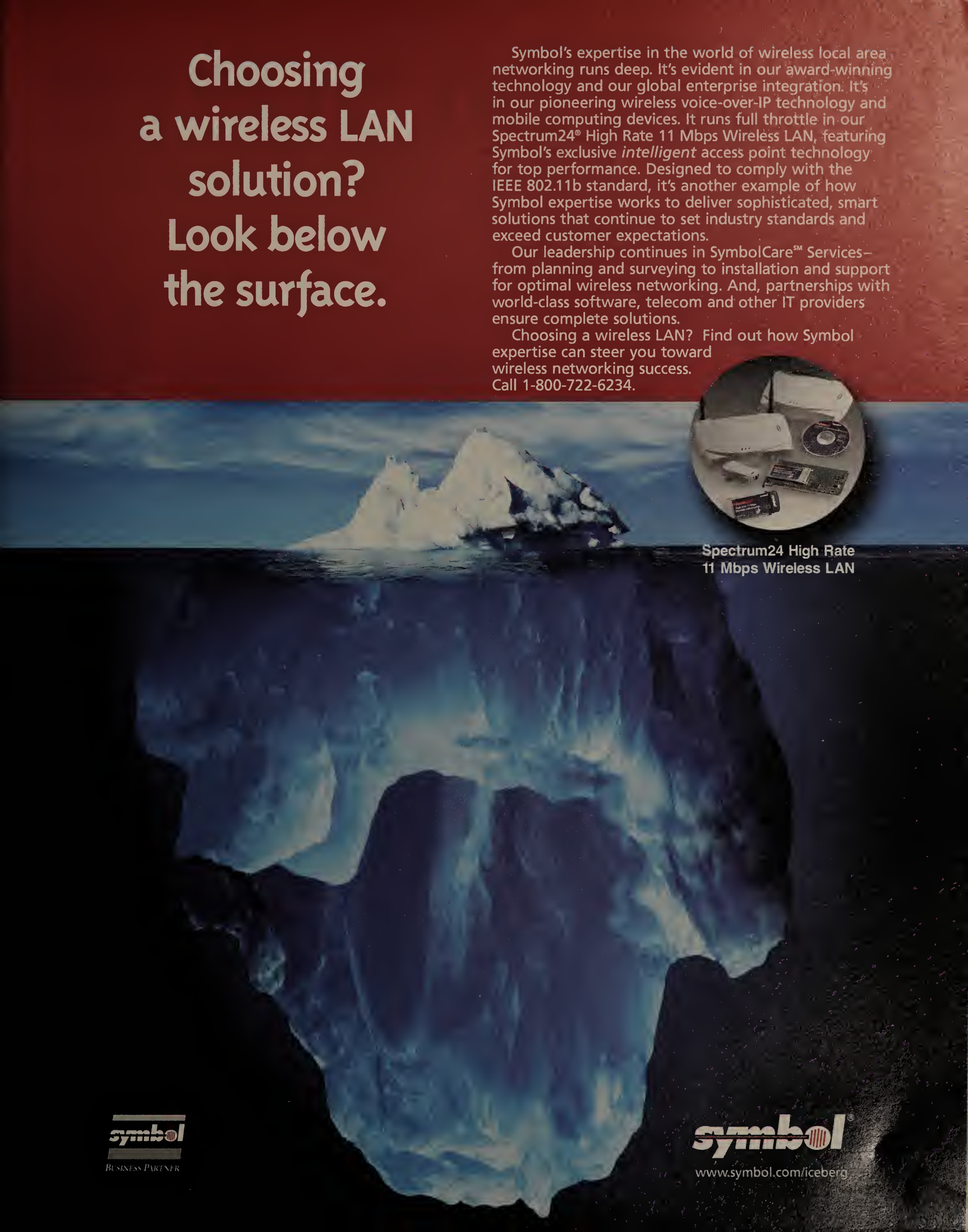
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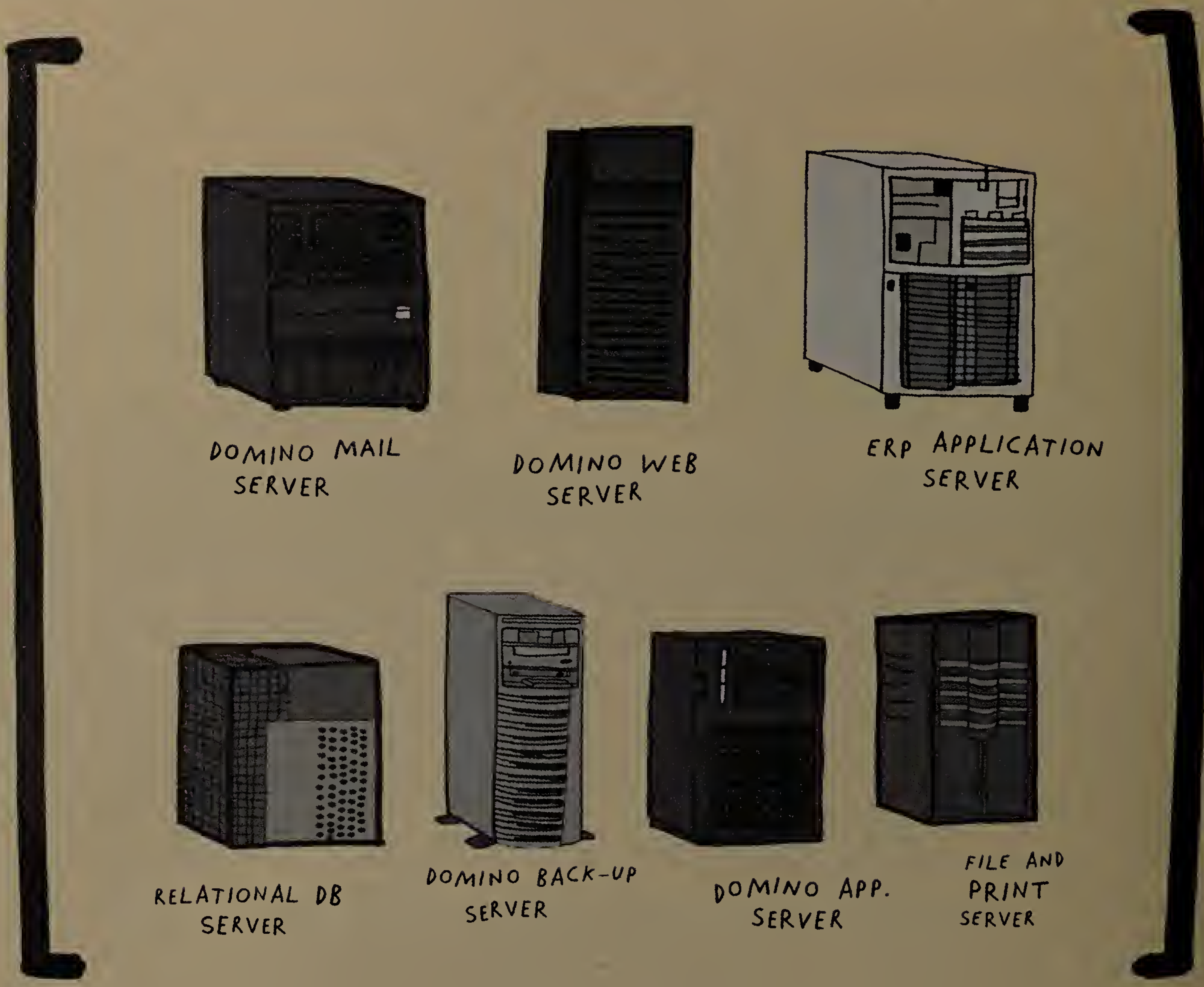

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Technology Update

An Inside Look at the Technologies and Standards Shaping Your Network

Label switching aids scalability, QoS

BY SPENCER GIACALONE

Mainly defined as a set of Internet Engineering Task Force drafts, Multi-protocol Label Switching (MPLS) is a technology that can address ever-increasing network requirements.

The benefits of MPLS include improved network scalability, quality of service (QoS) and traffic engineering. MPLS QoS supports sensitive data such as video by incorporating mechanisms that can provide such traffic with preferential treatment. MPLS traffic engineering allows manipulation of data flow across networks, so that new services can be offered. Additionally, unlike other technologies, MPLS won't consume your budget because many existing routers and WAN switches support the standard.

MPLS presents a simple way to forward information through networks by installing and then examining short, fixed-length ID markings called labels in packets. By relying on labels to forward information, MPLS usually doesn't use a packet's IP header unless it is entering or leaving MPLS. Because labels reduce dependency on IP data, new and larger network designs become possible.

MPLS-enabled devices — called MPLS nodes or Label Switch Routers (LSR) — process labels at Layer 2. Therefore, slower network devices may work more quickly when enabled for MPLS. In some scenarios, the MPLS label can be directly integrated with other Layer 2 protocol headers. Because MPLS nodes can find integrated labels more rapidly than IP data or regular MPLS labels, network performance may be further improved.

As a packet arrives on an MPLS node, its label — provided there is one — is compared to an onboard database called the label information base (LIB). The LIB contains a table that is used to add a label to a packet, or change/remove the existing label, while determining the outgoing interface to which the data will be sent. After consulting the LIB, the MPLS node forwards the packet toward its destination. The LIB can simplify forwarding and increase scalability by tying many incoming labels to the same outgoing label information, providing a new type of integrated summary routing.

When a set of MPLS nodes have information in their LIBs related to the same destination, a label switched path (LSP) has been created. LSPs may be built automatically by the label distribution protocol (LDP) or other protocols.

In the simplest form of LDP, each MPLS node informs upstream (that is farther away from a destination) nodes of which label they should apply to packets that are heading to a destination downstream. Label distribution is normally based on routing protocols such as Intermediate System to Intermediate System, Border Gateway Protocol or Open Shortest Path First. Because all MPLS nodes use a routing protocol, the inherent benefits of these protocols, such as fault-tolerance, are retained or expanded. When enabled in WAN switches, routing protocols can simplify routing and increase network scalability. Scalability can also be increased by deploying MPLS tunnels, which are LSPs that carry routing information and/or other LSPs. Tunneling allows network devices to be shielded from unneeded network information, thereby operating more efficiently.

QoS and traffic engineering components round out MPLS' core features. As part of LDP, forwarding equivalence classes specify selected data that should use a particular LSP. MPLS nodes can then provide basic QoS to that LSP and the chosen data within. Providing a basis for traffic engineering, explicitly routed LSPs are LSPs whose route through an MPLS network has been granted a priority, avoiding the automatic setup described earlier. Explicitly routed LSPs allow traffic to be engineered to travel through the net and avoid congested areas, according to QoS requirement, security need or other criteria.

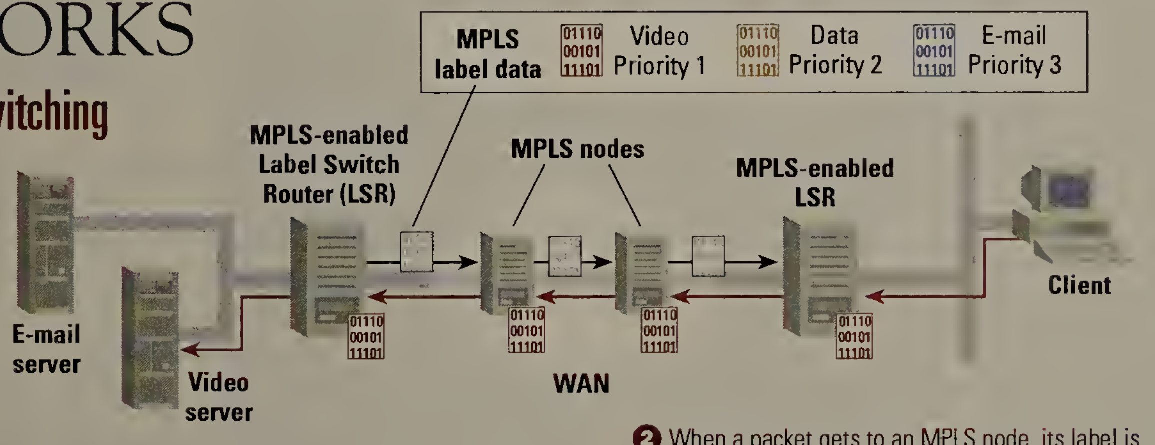
Considering the increasing expectations being placed on networks, the benefits provided by MPLS make it a promising technology. MPLS can enhance network scalability and performance while providing advanced services in a simple package. If you're upgrading an existing network or planning a next-generation network, MPLS is a concept to bear in mind.

Giacalone is a managing consultant at Predictive Systems, an international network consulting firm. He can be reached at Spencer.Giacalone@predictive.com.

HOW IT WORKS

Multi-protocol Label Switching

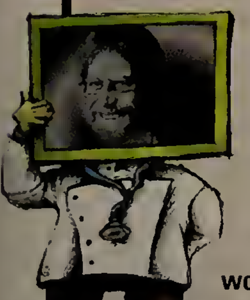
Multi-protocol Label Switching (MPLS) forwards information through networks by distributing and exploiting short identification markings called labels in packets. Use of the labels lets MPLS forward traffic without examining a packet's IP header, except when it is entering or exiting MPLS.


MPLS label data
01110 00101 11101 Video Priority 1
01110 00101 11101 Data Priority 2
01110 00101 11101 E-mail Priority 3
MPLS-enabled Label Switch Router (LSR)
MPLS nodes
MPLS-enabled LSR
Client
E-mail server
Video server
WAN
01110 00101 11101

❶ Each MPLS node tells upstream nodes which label they should apply to packets that will be heading to a downstream destination. A label switched path is created when multiple nodes have information about the same destination.

❷ When a packet gets to an MPLS node, its label is compared to information in its database, which tells the node where to send the packet. Efficiency is gained by the node tying multiple incoming labels to the same outgoing label information.

Ask Dr. Intranet



By Steve Blass

I'm attaching three Cisco 2501 routers to their own Ethernet networks and connecting them using a data communications equipment (DCE) to data terminal equipment (DTE) cable. The clock rate is set on the DCE unit, but the serial ports won't come up. Can I use the serial ports to interlink segments without a 4700-M modular router with multiple Ethernet ports?

The following configuration will bring up a physical line on a pair of Cisco routers connected back-to-back by serial ports. One cable must be DCE, the other DTE. The DCE cable will generally be female. DTE router: interface serial 0, no shutdown; DCE router: interface serial 0, no shutdown, clock rate 64000. Useful physical information is available with the 'show Controllers serial0' command, including the DTE/DCE role of the attached cable. These are the minimum configurations needed to get the physical lineup and the bits flowing. The Layer 2 encapsulation on the connection will be Cisco's HDLS encapsulation. Cross-vendor operation is not possible.

With three 2500 routers you can set one up as a Frame Relay or X.25 switch and have the two DTE devices exchange packets via a permanent virtual circuit. You can check this out at www.cisco.com/univercd/cc/td/doc/product/software/ios112/112cg_cr/4cbook/4cfrelay.htm#xtocid62034 or www.cisco.com/univercd/cc/td/doc/product/software/ios112/112cg_cr/4cbook/4cx25.htm#xtocid 370546.

Blass is a network architect at Sprint Paranet in Houston. He can be reached at dr.intranet@paranet.com.

Gearhead — inside the network machine . **Mark Gibbs**

SKINNY WINDOWS FOR YOUR TOOL CHEST

Do you remember back in 1998 when there was the big stink during the first volleys of Microsoft's prosecution by the Department of Justice over whether you could remove Internet Explorer from Windows 98 without breaking the system somehow?

The Redmond spinmeisters tried to make it look as though removing Internet Explorer was the trigger that would cause the end of life as we know it. Much silliness and posturing surrounded the issue, all in good clean fun.

Well, in December that year, a programmer by the name of Shane Brooks decided to have a crack at the problem and produced the "Win98 IE Extraction Project." This was, and is still, claimed to be the first utility to cleanly remove Internet Explorer from Windows 98.

Now why would you want to do such a thing? Brooks points out the following: The Windows directory drops from 130,608,199 bytes to 99,063,806 bytes while the registry files — system.dat and user.dat — shrink from 1,495,072 bytes and 114,720 bytes, respectively, down to 876,576 bytes and 49,184 bytes. Another 935,568 bytes are saved from the Internet Explorer files. That's a total disk space savings of almost 32.5M bytes!

The benefits are simple: More disk space is available, and because the registry is smaller, overall system performance is improved. Brooks suggests that these changes make Windows 98 run like Windows 95. Cool.

Well, that was back in '98 and '99. Microsoft has since made changes and upgrades and Brooks had to do some fancy footwork to stay compatible. The result can be found in a product called 98Lite 2.0 Professional.

Essentially, 98Lite allows you to make changes that can give your PC a significant performance boost. For example, 98Lite offers three different desktop configurations: "sleek," which uses the fast Windows 95 Explorer; "chubby," which provides Windows 98 Explorer with most Web integration components removed; and "overweight," which delivers Windows 98 Explorer with Web-view and active desktop (ugh!).

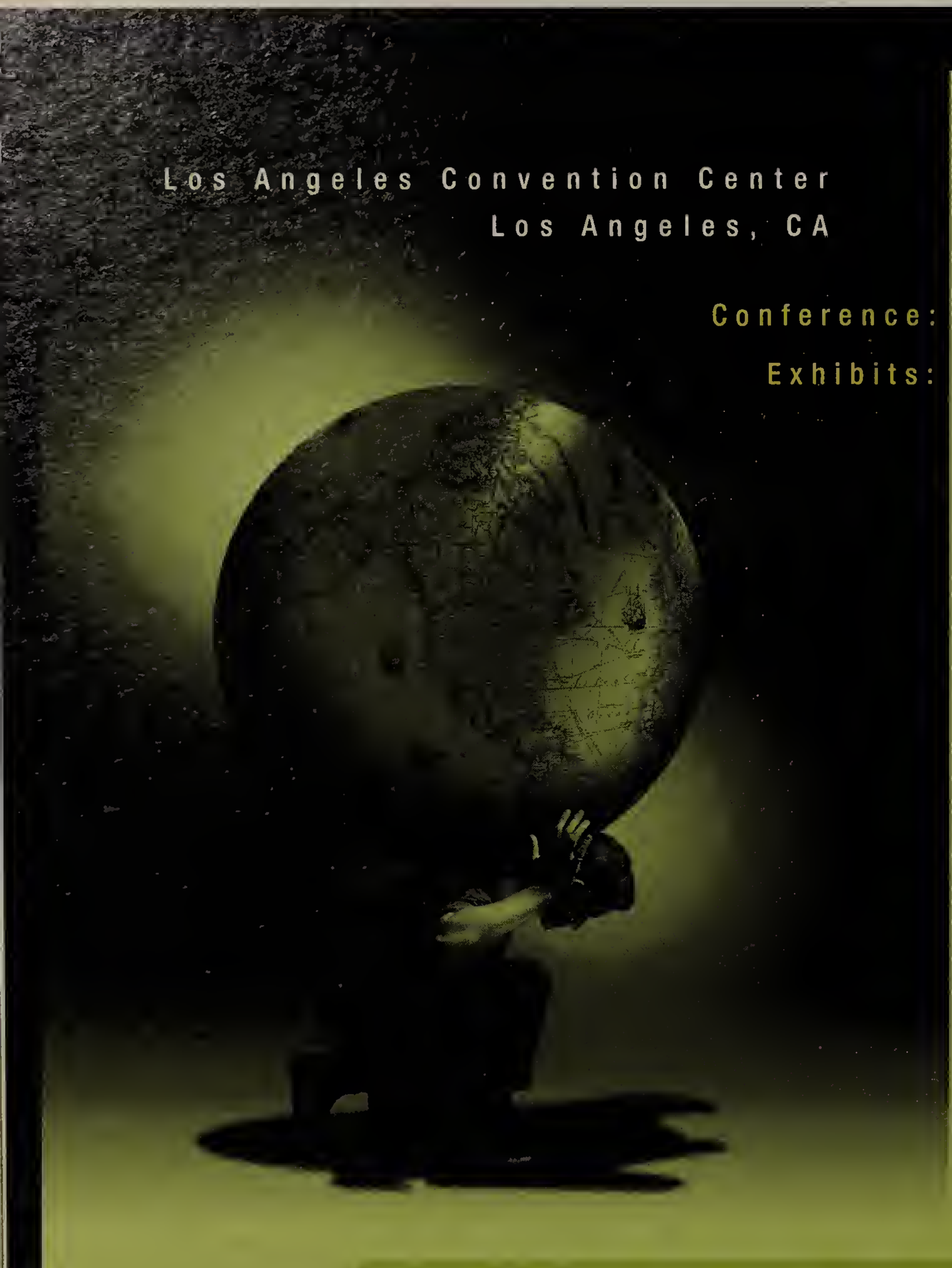
98Lite also promises to let you install Windows 98 or Windows 98SE (Second Edition) cleanly without Internet Explorer ever getting involved and remove Internet Explorer 4.0 and 5.0 from both operating systems. Versions to support Windows Millennium and Windows 2000 are planned as free upgrades.

One of the most interesting versions of Windows 98 is called "98micro," which Brooks describes as "the naked guts of [Windows 98] running at full tilt and totally Webless — the closest [Windows 98] has ever come to its operating system roots in less than 70M bytes."

The Professional version can also convert a number of the theoretically integrated Windows 98 components into optional features that can be removed or added using the control panel add/remove applet. 98Lite also supports multiple languages.

Gearhead has only just begun to play with 98Lite — it appears to do just what it claims and does it very well. Given its shareware pricing (starting at $25), 98Lite (www.98Lite.net) should be in your toy chest.

Send the skinny to gb@gibbs.com.



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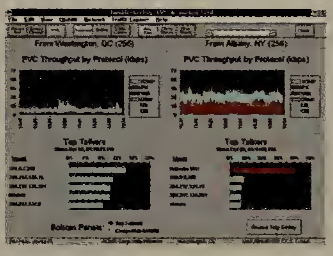

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Opinions

Editorial

Telecom on the cheap

Ever hear of a company called Sosinc? I hadn't either, nor will we likely hear too much more about it because it came out gunning for our enterprise market but has since washed its hands of it.

Then why do we care? Because its story tells something about voice-over-IP advances and WAN service pricing, both of which are near and dear to our hearts.

Sosinc is building a national voice-over-IP network using AT&T facilities and proprietary access gear of its own design. The company (www.sosinet.com) has boxes in 105 LATAs today, is currently installing 40 more, and hopes to be in all 192 LATAs by June.

Founder and Chief Technology Officer Bob Townsend says the original plan was to use this infrastructure to offer midsize companies low cost telecom services, but before he knew it other carriers and prepaid calling card companies bought out his capacity. His smallest contract to date is for 20 million minutes per month.

Although he won't name names, Townsend says his customer roster includes top-shelf long-distance carriers. The reason they buy from him: They can't carry the traffic as cheaply.

Sosinc can squeeze about 210 calls into a T-1 using its proprietary boxes, which essentially take in dial tone and spit out VoIP. The devices use Layer 2 routing, although Townsend will only go into the details if you sign a nondisclosure form. (I have. I'm waiting for a white paper.)

The end result is a network that enables Townsend to sell voice for between 1 and 6 cents per minute, depending on traffic volume. His on-net interoffice rate, say between New York and Los Angeles, is seven-tenths of a cent per minute.

Townsend says companies such as Amoco are getting voice for 4.5 cents per minute through AT&T Tariff 12 deals, but that is an on-net rate and doesn't include any switching. If you take all the bills and divide the total by the minutes used, it usually comes out to about 10 cents per minute.

None of the traditional carriers seem to be able to get below 5 cents per minute, Townsend says. That's why they are turning to him.

While Sosinc is content being a carrier's carrier, the company's tale makes it clear that VoIP is real and here to stay. It can't be long before the traditional carriers are knocking on your door with similar offerings.

— John Dix
Editor in Chief
jdix@nww.com

Message Queue

WHERE BLAME IS DUE

Regarding Mark Gibbs' "Backspin" column "The need to place blame" (Feb. 21, page 82) about the denial-of-service Web attacks:

I question Gibbs' assertion that "the victim sites we know of had little or no defenses." While this is probably true, it does beg the question "What defenses should they have had?"

A distributed denial-of-service attack, simply stated, comes down to a matter of pipe wars — whoever has the largest pipe wins. With distributed attacks, it is relatively trivial to achieve an aggregate bandwidth that exceeds the bandwidth of any other single site. Even if the servers are rejecting every single bogus packet, the pipe is still over capacity and therefore unavailable to the general public.

While I do believe that there is more that can be done at most sites, there is no foolproof way of protecting a site from an attack. If the federal government would spend its time and money educating Web site administrators and encouraging software vendors to make security patches available in an easier-to-handle format, we would be further ahead.

Tom Karrmann
Fond du Lac, Wis.

The recent spate of denial-of-service attacks ("Web attackers run roughshod," Feb. 14, page 1) has some questioning whether the third-party sites used to launch these attacks should be held accountable.

In my opinion the blame for the attacks falls squarely on the hackers. This not a simple case of just trying to see if they can beat your defenses, like a game of capture the flag. This is a case of their trying to deliberately disrupt your business. The hackers tried to electronically padlock places of business. Go try that at your local brick-and-mortar mall and see how fast you're thrown in jail.

Ken Graham
Systems engineer
Galileo International
Englewood, Colo.

FINDING USES FOR CDPD

Regarding Mark Gibbs' "Gearhead" column "AirCard: A reasonably good way to stay in touch" (Feb. 7, page 54):

I agree with Gibbs' comments on Cellular Digital Packet Data (CDPD). My organization started deploying CDPD over two years ago, first using Spider Modems and then switching to Sierra Wireless. In the beginning, I thought CDPD was useless. But I grew to like the technology because we started finding the right applications for it.

Currently, three of our WAN offices are totally wireless. They access our billing system through a telnet-like terminal and access e-mail through Outlook Web Access to our Exchange Server. Both applications require very low bandwidth. We even have one customer who uses CDPD as his upstream link for his DirecPC Satellite system.

Ric Sproul
Network administrator
Eastern New Mexico Rural — Plateau Telecommunications
Clovis, N.M.

INTEGRATION ISSUE

Regarding your Face-off on using a third-party ASP vs. leasing applications from the vendor (Feb. 7, page 68):

If I outsource a Siebel sales force automation package to an ASP and Oracle Financials to Oracle, I am drifting away from being able to centralize my user access via directory services. If I give the work to an ASP qualified to support both packages, the ASP also can improve my users' experience by centralizing administration and access control. If I deal with Siebel and Oracle directly and want integration, I have three vendors, not just one, to work with.

I think the decision point for customers of ASPs is, how much integration vs. customization is necessary? If you want tighter multiapp integration, and very little customization of individual apps, a classic ASP is the right approach. If you want more customization, then your best bet is to work with capable vendors and manage the integration yourself.

Ken Cox
Rockville, Md.

Send letters to nwnews@nww.com or John Dix, editor in chief, Network World, *118 Turnpike Road, Southborough, MA 01772. Please include phone number and address for verification.*

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Bottom Line . Joel Snyder

DON'T BE DUPED INTO A DENIAL-OF-SERVICE ATTACK

There is no defense against a denial-of-service attack. Just ask your security staff. They'll hem and haw and mention some products you can buy. But then you'll start hearing terms right out of the Vietnam War: "mitigate losses" and "acceptable casualty rate." If you're connected to a public network like the Internet, some bad guy will be able to devise a way to deny you service. Distributed denial-of-service attacks, in which hackers use hundreds or thousands of unwitting third-party systems to do their dirty work, are just a further iteration in the battles.

There are, however, ways of reducing your chances of becoming either an attack victim or an unwitting dupe used to attack someone else. I'm assuming you already have a firewall and security policy of some sort and regularly scan your systems for known vulnerabilities. In addition, here are four steps you can take to help make the Internet a safer place:

- **Get your ISP to help.** ISPs have a huge amount of power to cut down these attacks, but most are too lazy or ignorant to do anything. Put pressure on your ISP to add filters or access lists that restrict packet source addresses to all customer interfaces. In addition, your ISP may have suggestions for configuring your on-site router to practice safer networking — restricting you from acting as a packet amplifier, for example. If your ISP gives you a blank stare, change ISPs. The stupid ones don't deserve to survive.
- **Keep your test systems off-net.** You undoubtedly have some boxes that are in test mode and haven't had their security configuration fully locked down. These are the systems most likely to be compromised because no one is paying attention to them. Put these boxes behind some sort of very simple firewall, access list, filter or network address translation box. You don't need total protection; you simply want to block incoming connections to them. If they can't be hit, they can't be compromised.
- **Don't deceive yourself about your inconspicuous nature.** Script Kiddies look for systems by the thousands to compromise using random IP addresses. Just because you're small and obscure doesn't make you any less a target. At Opus One, we see port scanners come through daily, looking at addresses that have no Domain Name System entries and haven't been used for years. If they can find those addresses, they can find yours. This means you must pay attention to all parts of your network — not just the obvious servers, but anything which can be seen from the Internet.
- **Talk to your telecommuters.** Joe DSL and Jane Cablemodem are now the No. 1 candidates for a break-in — they're always on, have high-speed lines and probably don't pay much attention to security configuration at home. They are an accident waiting to happen. Invest in inexpensive small office/home office firewalls from vendors such as NetScreen and SonicWall. Break-ins to home systems can spread throughout the corporate network like wildfire, and a little prevention here can save you major headaches later.

Snyder, a Network World *Test Alliance partner, is a senior partner at Opus One in Tucson, Ariz. He can be reached at Joel.Snyder@opus1.com.*

Industry Commentary . Frank Dzubeck

THE FRUSTRATIONS OF A DSL BUYER

Industry analysts are often caught up with projecting a vision of the future rather than the reality of the present. Take the implementation of broadband services, for example. Digital subscriber line (DSL) was going to be the simple solution that brought inexpensive broadband services to the home and small business. But DSL's potential is being impeded by service provider provisioning incompetence and politics.

My firm has experienced firsthand the complexity and frustration of ordering and implementing DSL. We recently decided to switch one of our offices from ISDN to symmetric DSL (SDSL) and change the provider of our Internet access, hosting and e-mail services. After searching for SDSL vendors in our area, we began vendor and service selection. First we went to the Web and gathered service plan documentation. No two plans were alike, preventing a simple apples-to-apples comparison — good marketing differentiation, but frustrating to the buyer.

Then we began to contact the vendors' sales departments. Frustration now began in earnest. Some vendors neither called back nor replied via e-mail. Some lacked knowledge or understanding of their own Web-based literature. A few were responsive and could explain and differentiate their offerings. We solicited sample order forms from these few for final comparison and chose an ISP. Selection was based upon vendor quality, availability of service, monthly cost, service plan and features including service commitment level, installation cost and sign-up incentives.

With vendor and service plan selected, what should have been an easy install became hell. The promised due date for the service came and went; our voice and e-mail complaints were unanswered. Finally, we were informed that we had been assigned an account manager — a person who communicated only via e-mail and never gave a straight answer. Our frustration was now due to organizational incompetence.

We were then informed that the ISP had passed our order on to a competitive local exchange carrier (CLEC), which was having scheduling difficulties with the local exchange carrier (LEC). In addition, we were told our order was promised for 60-day rather than 30-day delivery. The next e-mail notified us that the LEC had missed its install date. The rescheduled date came and went, yet still we were informed that the LEC installation was complete.

When the CLEC installer finally arrived several weeks later, he couldn't find the LEC termination. An hour of research revealed that the LEC had mistakenly installed the termination in another building in the complex. Luckily, the installer was an ex-LEC employee and able to reroute the termination to our building. But if an operational problem occurs, it will be a diagnostic nightmare to isolate the connection path.

With the DSL installation completed, our ISP service should have been available. Well physically, yes, but logically, no. The ISP had provided the CLEC with incorrect router addresses. Once we resolved the address problem, we had DSL Internet access service on the LAN.

Next we had to move domain names from the old ISP to the new one. Although multiple domains are standard in most ISP plans, we found out that the one we had selected included only one domain. We went back to our ISP sales representative, who told us that because this was an order add-on rather than a new order, we required a new contact. After another series of e-mails, we finally contacted an add-on sales person.

We then discovered that in order to change domain addresses, we had to make a request to InterNIC in conjunction with the ISP. Our ISP sent the base request to InterNIC, which sent a set of e-mails to us for updating and confirmation. We completed these and sent them back to InterNIC — only to be told that InterNIC could not process the request because it "was not submitted from the appropriate e-mail address." This problem took a while to analyze and correct because we had no idea what "appropriate e-mail address" was originally used to order each domain name. Then it was a simple task to update our LAN e-mail software. Finally, we were able to cancel our old ISDN and ISP services.

The entire effort, not including vendor selection, began with an order on Oct. 21, 1999 and ended with the canceling of prior vendor services on Feb. 16, 2000 — almost four months of frustration for an order that should have taken less than two weeks to fulfill.

Yes, DSL is a better, faster and less expensive way to access the Internet. Unfortunately, it's saddled with back-office systems that belong in the Dark Ages and politics that may require regulatory oversight. These problems must be addressed or DSL will continue to frustrate everyone.

Dzubeck is president of Communications Network Architects, an industry analysis firm in Washington, D.C.

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BARRIERS SLOW DO

It's so tempting.... one management system for voice and data instead of two, not to mention nifty new applications like unified messaging. But vendors still need to resolve some key issues before most enterprises will feel comfortable enough to dial into voice over IP. And in the meantime, carriers are preparing to offer voice-over-IP services.

VoIP implementation: For pioneers who can't wait to implement voice over IP, here's a guide to setting up your own voice-over-IP network. **Page 55.**

Case study #1: Scientists at the South Pole are using IP telephones and bouncing voice traffic off satellites in order to communicate with co-workers in the U.S. It sure beats the old system — ham radio. **Page 57.**

Case study #2: The state of Alaska is eyeing voice over IP as a money saver and as a way to deliver virtual services to citizens scattered across its vast expanse. **Page 61.**

Management Strategies: When networks converge, it may seem like the net heads will come out on top against the Bell heads, but telecom specialists have plenty of marketable skills. **Page 63.**

More online:

Our Interactive Buyer's Guide lets you compare voice-over-IP gateways and services from more than 50 vendors.

Daewoo International is using voice over IP to reduce its telecommunications staffing and save money on long-distance charges.

Case studies, primers, vendors information and more in our new voice-over-IP research area.

TO VoIP

WN ENTERPISE IMPLEMENTATIONS

KRISTEN MELLOY

Barriers include lack of applications and lack of converged network management tools.

BY PETER CLEGG

Voice-over-IP vendors are flooding the market with IP phones, gateways, converged appliances, stand-alone boxes, expansion cards, expandable routers and IP PBXs. Carriers are racing to convert their networks to IP so they can offer voice-over-IP services.

But how's this for a reality check: Less than 4% of the 70 billion voice minutes logged last year were over IP, according to Probe Research.

And for good reason. Although voice over IP offers potential cost savings and opens up the possibility of new applications, as things stand today, there are significant barriers to voice-over-IP implementation and very few real incentives.

Let's start with cost savings. Voice over IP is supposed to save you money by eliminating expensive long-distance calls, often referred to as long-haul toll bypass. But toll charges have dropped dramatically in the last two years. And an Internet telephony system in many cases requires upgrading to a switched LAN, which adds a significant cost.

Bottom line: You're simply not going to save a lot on long-distance charges by switching to voice over IP.

You could try running IP voice over an existing WAN that has excess bandwidth. This strategy works within a closed, switched network, a WAN, LAN or virtual private network. In closed systems, you control the utilization and quality of service (QoS). Of course, that raises the issue of why you're paying for excess bandwidth in the first place. Maybe you'd save more money reducing your WAN bandwidth charges.

Barrier No. 1: Management tools for converged networks won't be available for two to three years

The more enticing potential cost savings from voice over IP is the opportunity to slash network management costs. Put simply: Most enterprises typically have separate phone and data networks with completely different wire infrastructures, separate equipment, operations centers, trained administrators and distributed end-user devices. Voice over IP gives you the ability to consolidate them into one network.

Specifically, with Web-based management of voice switches and PBXs, the use of directories to handle adds, moves and drops for both the phone system and network users, and Ethernet phones that plug right in to 10Base-T jacks, equipment is consolidated, administration is streamlined and overall costs are reduced.

Voice-over-IP proponents point out that 70% of ongoing network costs are related to administration, and companies that are consolidating phone and data networks could slash their network administration costs by more than half.

But those estimates may be very optimistic, according to Gartner Group analyst Kathleen Simpson, who points out that voice and data are historically different mindsets and skill sets.

She says management tools with common interface, alarms and maintenance capabilities to handle a converged network are two to three years away. Without them, it's difficult to realize lower management costs.

Barrier No. 2: Applications are six to 12 months away

Aside from cost, new features are a second motivation for implementing voice over IP. For example, you can integrate with voice gateways to create Web applications that are logic-driven, although these applications generally need to be custom-developed.

E-commerce customers could browse to a certain point and then connect by phone to a sales representative who sees the browse trail and customer history. Also, virtual phone systems can be created providing voice mail, speed dial, conference calling and other typical phone features, no matter where you are in the world (see graphic, page 52.)

If cost isn't a real motivator for implementation, these new features can be. IDC Analyst Paul Strauss says the benefits of an IP-based phone network include shared conferencing that doesn't require operator setup, simultaneous voice and Web presentations, combined inboxes and aggregated billing. He says larger businesses need call centers with automatic call distributors that forward calls across states and allow incoming calls to be routed to remote centers or to homes.

He sees these new applications as the drivers for voice over IP and says we can expect to see such products coming to market late this year or early next year.

COMING ATTRACTIONS

AUTOMATED CALL DISTRIBUTION: Great for customer call centers, distributes calls based on custom-created policies to remote call centers or home offices.

WEB INTERFACE: Phone system equipment and end-user phones managed via a Web interface.

UNIFIED MESSAGING: Voice, e-mail, fax, paging and video all in one mailbox.

FAX OVER IP: Eliminates the need for that extra machine and paper.

VOICE-BASED E-COMMERCE APPLICATIONS: Voice, Web and database information provided to customers, suppliers, and sales and service groups.

CLICK-TO-DIAL: Phone integrated with PC so directory search yields button to click for dialing.

CLICK-TO-TALK: Surf a Web site to point where you need human help and click to talk to a support or sales representative.

ADVANCED CALL CONTROL: Call forwarding, multiparty calling, aliasing, conference calls and other features are all easily handled by end users. Conferencing is of higher quality.

MOBILITY: Plug in an IP phone anywhere on the Internet and have same access.

VIRTUAL PRIVATE TELEPHONE NETWORKS: Use the Internet infrastructure, but create a virtual phone system with standard features such as transfer, local extension calling, forwarding and voice mail. Users are distributed anywhere on the Internet.

Barrier No. 3: The Internet is still too unreliable

The general Internet infrastructure isn't stable enough today to support voice calls. Because the 'Net without QoS is unpredictable, the resulting latency produces poor or unacceptable voice quality.

You need QoS network protocols such as Multiprotocol Label Switching (MPLS) and IP type of service (ToS) to sort voice from data packets and guarantee that voice packets are received in an acceptable amount of time.

The bottom line: Companies need a packet-switched network with QoS protocols for voice with IP telephony applications to reliably match a public switched telephone network (PSTN).

Barrier No. 4: Standards are still evolving

According to analysts and vendors alike, a significant barrier to ubiquitous IP telephony is the elementary state of the interoperability standards in the voice-over-IP arena. The reason is that while the standard is there, the interpretation is still loose, which is typical for evolving standards.

The International Telecommunication Union has released Version 2 of the H.323 interoperability standard, an upgrade to the original H.323. New features included call hold, call park and pickup, call waiting, message waiting, and some fax and multimedia broadcasting capability. These are features that basically map voice calls over IP and standardize call connections, allowing calls from different systems to interoperate.

However, H.323 Version 2 provides only the foundation of functionality for call interoperability. What's lacking is a common standard for the rich set of potential IP telephony features and applications. The bottom line: Getting voice conferencing on your system to work with your business partner's on another system will be difficult.

However, this situation could change with the new Media Gateway Control Protocol (MGCP) standard. MGCP has been submitted to the Internet Engineering Task Force and is backed by vendors and carriers. It provides some level of interoperability. Calls that interact with applications such as Web pages will be able to interoperate with other IP calls. For example, a user of a Cisco phone network could set up a voice conference with users of Nortel Networks and Lucent phone networks.

Additionally, standards for QoS are critical for successful voice over IP. IP ToS, part of the IP packet header, can assign special treatment, such as routing, to packets. ToS signaling, Real-time Transport Protocol header compression, and MPLS are standards that work to reduce IP overhead by directly reducing bandwidth requirements. That could indirectly reduce latency and ensure QoS to the level required for voice calls.

Despite these concerns and others, such as security, momentum is building. Carriers have generally accepted that circuit-switched networks will be replaced with packet-switched IP and are gradually implementing and upgrading infrastructure to handle it. This movement in the long run will eliminate problems such as poor QoS, the need for conversion, and mapping and translation devices. ISPs likewise will be providing IP dial tones and call management services.

If you have a working phone system now, you may want to wait. Full IP telephony outside of a closed system is still a way off, but it's coming.

On the other hand, if you have the need for IP telephony features now or think you could realize some benefits from implementing a voice-over-IP gateway, sit down and work out your own convergence strategy. Consider the benefits from toll bypass and identify which gateways are available to meet your needs.

You could consider using an IP PBX internally and switching to PSTN for outside communication. Or decide on a collection of individual or hybrid products that will handle your current needs while positioning you for full IP telephony in the future. Designing your converged voice and data strategy is not a simple task, but there is no shortage of available options.

Peter Clegg is a technology writer and consultant associated with Key Labs and Beacon Strategies in Utah.

Online: See *Network World*'s VoIP Buyer's Guide database, which features voice-over-IP gateways from these 43 vendors:

- 3Com
- AltiGen Communications
- Artisoft
- Cabletron
- Cirilium
- Cisco
- Clarent
- Ericsson Datacom
- e-tel
- Franklin Telecom
- Infosoft Technologies
- Info Systems
- InnoMedia
- Inter-Tel
- Komodo Technology
- Lynk USA
- MCK Communications
- Memotec Communication
- Mockingbird Networks
- Motorola Internet and Networking Group
- Multi-Tech Systems
- NexTone Communications
- Nitsuko America
- Nortel Networks
- Oki Network Technologies
- Pivotal Networking
- Quintum Technologies
- Science Dynamics
- Shoreline Teleworks
- Sonus Networks
- Sosinc Communications
- Sphere Communications
- TEK DigiTel
- TollBridge Technologies
- Tundo
- Unisphere Solutions
- Vertical Networks
- Vive Synergies
- VocalData
- VOCALscape Communications
- Zhone Technologies

VoIP services from 10 vendors:

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- Equant
- Global Crossing
- GTE Internetworking
- InnoMedia
- ipx
- Nexbell Communication
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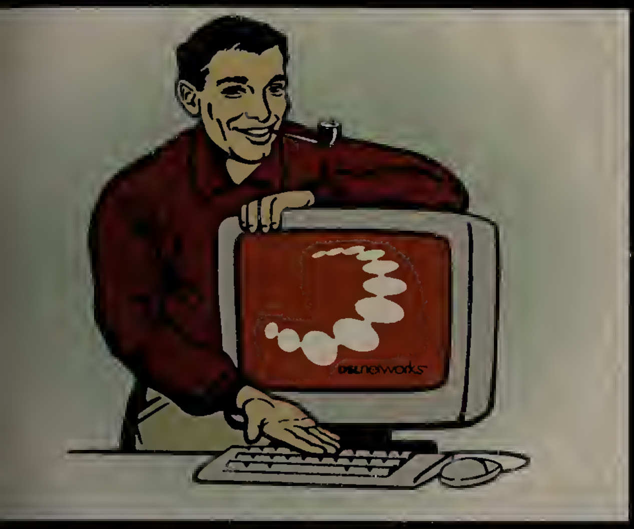

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FOUR WAYS TO DO VoIP

A do-it-yourselfer's guide to installing voice over IP on your enterprise network.

BY PETER CLEGG

If you want to get started today on a transition to voice over IP, there are four options: gateways, IP PBXs, converged appliances, and other.

Gateways: popular, but lack features

A voice-over-IP gateway can be loosely defined as a mechanism that takes circuit-switched voice from a traditional PBX, converts it to IP and transfers it across a LAN or WAN to another gateway where it is reconstituted back into a format that is understood by the receiving phone system.

Gateway functionality can be obtained through stand-alone boxes, modules or chassis cards for proprietary boxes; also expandable routers or software and expansion cards for Windows NT servers.

For example, Cisco is taking a modular approach with a voice-over-IP card that fits its 1750, 2600 and 3600 series routers. Suda Madabusi, product manager for the Cisco 1750, says all Cisco products can easily be equipped for voice. Cisco says voice packets can be guaranteed via quality-of-service policy implementation on a Cisco-switched network.

Lucent, Nortel Networks and Siemens offer similar strategies for providing voice-over-IP gateway capabilities in some form or another.

While gateways are the most popular voice-over-IP products on the market — available from at least 30 vendors — the key point here is that you have voice packets running over IP. However, the packets are not running on the Internet, and you're not gaining any of the features and capabilities you get by converging voice and data networks.

KRISTEN MELLON

IP PBXs: great features, scalability lacking

IP PBXs, such as Altigen's AltiServe and Artisoft's TeleVantage, are great if you have the luxury of designing your system from the ground up. IP PBXs are complete phone systems, usually with IP phone options that include many of the IP telephony applications, such as managing your phone from your desktop PC, multiline call control and automatic call distribution.

IP PBXs are usually NT servers with telephony software and voice cards. Disadvantages often include scalability and a dial tone that's dependent on NT, which doesn't offer the same uptime as a switched phone network.

Until recently, IP PBXs have mainly been targeted at small or branch offices with 100 users or less, but Alcatel recently announced OmniPCX, a voice-over-IP system that incorporates gateway and call processing in a single device and can accommodate up to 50,000 users. Additionally, 3Com, Lucent and Cisco have all announced plans to provide the same type of product.

Cisco's Selsius products and 3Com's NBX series fit in this category because the goal of both is to provide the same services as OmniPCX on a large scale. However, while initial versions of these products are in trial stages, they have not been proven for high numbers of users. Alcatel is the first to stake that claim, and Cisco and 3Com will have products in the future that compete. 3Com now says its product is only for midsize businesses with less than 500 users.

The beauty of an IP PBX is being able to create a distributed system. For example, Nokia's IP Telephony Gateway and Shoreline Teleworks' ShoreGear IPBX allow you to distribute your phone system throughout an IP network, so geographically separated phones — with features such as direct dial, call forwarding, conferencing and voice mail — provide the appearance of being connected directly to the local PBX. Alcatel's, 3Com's, Lucent's and Cisco's IP PBXs do not offer these features.

Converged appliances: simplified management

Converged appliances that join phone and data networks provide the simplified management that fulfills the promise of voice over IP. Several vendors offer such appliances. For example, Vertical Networks' InstantOffice offers call services, voice mail, routing and LAN connect for voice and telecom, for a small to midsize office, all included in the same box and managed together. Also, Praxon's PDX, a modular communications platform, combines voice PBX features with a full complement of data networking, messaging and Internet functions.

Other options: mix and match

Aside from stand-alone gateways, IP PBXs and converged appliances, there's the other category we've defined. Interestingly, this other category is not necessarily the smallest. In fact, given the number of insertion points for voice over IP and the options available, it's probably the largest.

Lucent, for example, has a line of products that allow the convergence of your existing voice with IP system at different points along the chain. Want to IP-enable your existing Definity PBX? PacketStar ITS-E is the option you need. Want IP-based trunking? You can use the Definity IP Trunk for Enterprise. Want just IP phones? You can buy Definity IP Ethernet Telephones. Want to leave analog phones and fax machines in place, but have an IP PBX? IP Exchange-Comm answers the call.

VocalTec also provides piece parts such as the VocalTec Gatekeeper for IP address-to-phone number mapping. There's also VocalTec's InternetPhone, an audio/video/PC phone and the VocalTec Telephony Gateway Series 120 and 2000, two versions of IP public switched telephone network gateways. Additionally, Cisco, Nortel and 3Com have also outlined convergence strategies with products that do everything from single device IP integration to complete infrastructure replacement. ◪

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VoIP smokes at minus 100 degrees in Antarctica.

BY IAN LAMONT

No roads lead here. There is no sun for half the year. The nearest place to get supplies is 800 miles away, the nearest city is some 3,000 miles away, and the only way to get here is by plane, weather permitting.

Welcome to the U.S. Amundsen-Scott South Pole station, home to just 250 people during the Antarctic summer and one-fifth that number the rest of the year. Until recently, their communications with the rest of the world were extremely limited. That changed with the arrival of voice over IP.

Jeff Thompson, a network engineer for the United States Antarctic Program (USAP), was responsible for upgrading communications links with the isolated Amundsen-Scott South Pole base.

Clearly, the rudimentary voice links that relied on ham radio and ATS-3, an ancient NASA satellite originally used to support the Apollo lunar missions, were simply not enough to meet the growing requirements of the scientists and support personnel at the South Pole.

But upgrading the system to handle the needs of a world-class research facility wouldn't be easy. Because of the station's isolated location and the frigid environment, building a new communications infrastructure would be very impractical — since there are no roads leading to the station, equipment and workers have to be flown in by special military aircraft during the Antarctic summer. In addition, temperatures reaching minus 110 degrees Fahrenheit the rest of the year not only make prolonged work outside impossible, but also require equipment that can withstand the extreme conditions.

Then there were costs to consider — laying an undersea cable beneath the churning South Atlantic and building a land link from the coast would total more than $200 million, while building a microwave link to McMurdo station, a larger U.S. base on the Antarctic coast with 24-hour T-1 access, would cost an estimated $45 million. Other options were also deemed too expensive.

In the end, Thompson's communications woes were solved by new satellite links and a new technology: voice over IP.

"The implementation of VoIP was the only solution that would allow voice traffic at a very small cost," says Thompson, a former Navy engineer who first came to Antarctica 10 years ago and is now vice president of technology at Holmes & Narver/McClier, one of the primary contractors for the USAP.

The key to setting up the voice-over-IP network was the arrival at the pole of three satellites — GOES-3, LES-9 and TDRS F1 — for data communications. In 1998, the University of Miami, which operates two of the satellites' ground stations, installed a Selsius call manager and sent several Selsius

STEVE ZAVODNY

"VoIP was the only solution that would allow voice traffic at a very small cost."

Jeff Thompson, vice president of technology, Holmes & Narver/McClier

IP phones to the South Pole for trials.

Thompson liked what he saw. "We tested them out during the summer of 1998/1999 at South Pole station," he says. "This allowed South Pole to make commercial toll-grade calls for the first time."

Realizing the potential of voice over IP to drastically improve voice communications from the South Pole, Thompson and his colleagues began to explore ways to move from a testing phase to a full-scale implementation.

There were several factors that had to be taken into consideration. Because the South Pole's location falls well outside of the footprints of most geosyncronous satellites, direct links are only possible with satellites in highly inclined orbits that are only visible at certain times of the day.

Because of LES-9's limited bandwidth, it was relegated to handling low-speed Internet traffic only. TDRS F1, however, could easily manage voice-over-IP traffic on its two-way, 1024K bit/sec data link, while the satellite's one-way, 6M bit/sec transmitter could be used for the transmission of large graphic and data files by the astronomers, physicists and climatologists working at the South Pole. GOES-3 was also assigned voice over IP and data traffic.

At the South Pole, and at the satellite ground stations at the University of Miami and White Sands, N.M., Thompson and his colleagues gradually took on the task of expanding the voice-over-IP system. Since last June, a number of new components have been installed at the South Pole station's communications building and several outlying structures, starting with a half-dozen Cisco 12 SP+ IP phones, which are plugged into a Catalyst 2924M-XL distribution switch with two 100BaseFX uplinks to a Catalyst 6509 core switch.

From there, the voice-over-IP traffic travels over fiber-optic cable to a Linux-based Netmax Firewall, then to a Packeteer PacketShaper 2000, where quality-of-service standards are applied. The traffic is then passed on to a Cisco 4000 router, and either sent to the satellite dish for GOES-3, or to a Cisco 2500 router that oversees traffic to the TDRS F1 satellite uplink.

The GOES-3 voice-over-IP traffic arrives at a ground station in Florida, where it is channeled via two T-1s to the University of Miami. The TDRS F1 traffic, on the other hand, is downlinked to White Sands and then sent over the NASA backbone, which is connected to the University of Miami by two T-1s.

At the University of Miami, the voice-over-IP traffic arrives at the university's Windows NT-based call manager before being passed off to either a Cisco DT-24+ digital voice-over-IP gateway or to one of two analog Selsius gateways, which are connected to the university's PBX. According to Thompson, there were some integration issues at the university, but these have since been overcome. Still, after his experience building and tweaking the South Pole voice-over-IP system, he hopes future product releases will include "Unix-based call managers and the ability to move phones from subnet to subnet with zero reconfiguration."

Overall, however, Thompson is extremely satisfied with the voice-over-IP phones. He adds that more improvements are on the way, in line with the South Pole Station Modernization (SPSM) project, a $128 million endeavor to modernize the living quarters, scientific equipment, support buildings and IT infrastructure at the Amundsen-Scott base and outlying scientific structures by 2005.

"We currently have six phones scattered around the station, and as part of the SPSM we'll [probably] be installing a total Ethernet-based phone system. We will, however, have analog copper lines for 911 services," he says. Other upgrades under consideration involve adding up to 15 more IP phones, incorporating a planned link to the Marisat F2 satellite and building a new ground station at the South Pole.

There is also talk of discarding the Ethernet-based phone system in favor of a different architecture that would include a traditional PBX with a voice-over-IP interface at the pole.

Cost-wise, Thompson is pleased with the way voice over IP has worked out. The Cisco IP phones cost $350 apiece, and much of the other recently purchased gear was included in the budget for the ongoing SPSM network upgrades. "My network upgrade budget for this year, which included a core switch, eight distribution switches and the Packeteer, was around $175,000," he says. "We got really good pricing."

Users who have tried new voice-over-IP system are ecstatic with the improvement in communications. Steve Barwick, a scientist working on the Antarctic Muon and Neutrino Detector Array (AMANDA) astronomy project at the pole, remembers all too well the days before voice over IP.

"When I first started to come to [the] pole in 1992, communication was very restrictive," Barwick says. "Bandwidth was limited, so e-mail was censored to ensure that only business-related communication took place. For personal communication, a ham radio was used to patch to the phone system in the U.S. Sometimes four people were listening to your call, so privacy was not a strong concern."

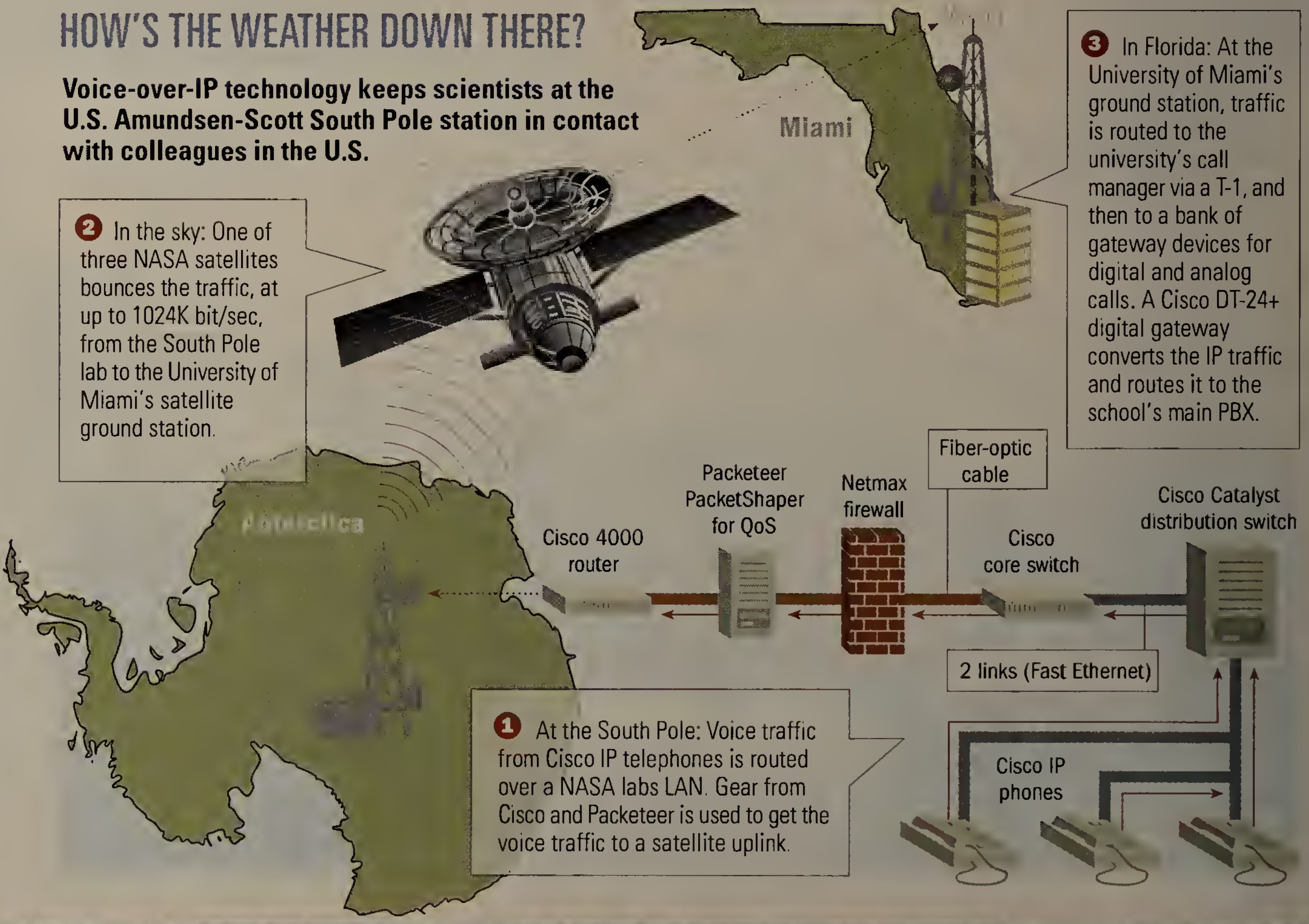
Barwick says there is a direct correlation between the integrated voice-over-IP/data traffic system and the amount of science that can be conducted by the AMANDA team.

"The voice-over-IP phone is now a useful scientific tool, since we can call from any phone at the station. This is a wonderful advance," Barwick says. "Imagine what it was like two years ago. If there was an unexpected problem and we needed to talk to a colleague in the U.S. or Europe and the satellite was up, we would walk about 1 kilometer to the phone, then usually wait for a clear period, and then get a busy signal or no answer. Compare that to now. We can call from the building that we normally work in. If the person on the other line is out, we can leave a message and that person can call us back. Voice communication becomes a viable tool when there is this level of convenience."

Thompson agrees: "VoIP has really changed the way we do business." ◪

HOW'S THE WEATHER DOWN THERE?

Voice-over-IP technology keeps scientists at the U.S. Amundsen-Scott South Pole station in contact with colleagues in the U.S.



❶ At the South Pole: Voice traffic from Cisco IP telephones is routed over a NASA labs LAN. Gear from Cisco and Packeteer is used to get the voice traffic to a satellite uplink.

❷ In the sky: One of three NASA satellites bounces the traffic, at up to 1024K bit/sec, from the South Pole lab to the University of Miami's satellite ground station.

❸ In Florida: At the University of Miami's ground station, traffic is routed to the university's call manager via a T-1, and then to a bank of gateway devices for digital and analog calls. A Cisco DT-24+ digital gateway converts the IP traffic and routes it to the school's main PBX.

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CALL OF THE VoIP

Alaska eyes voice over IP to connect state offices scattered across the vast, frozen landscape.

BY DEBORAH RADCLIFF

Alaska is so remote that many of its cities and outposts can only be reached by air or dog sled. Its communities are separated by expanses of tundra, densely forested mountains and more than three million lakes.

Nowhere is an IP-based communications network more vital.

"Given our size, remoteness and lack of roads, telecommunications is perhaps more important to Alaska's future than most any other place. It's really the only way we stay connected," says Bob Poe, commissioner of administration for Alaska.

Already, the state of Alaska has found the Internet to be the only effective way to bring government services to its populace of 630,000. Through Alaska's Web mart, www.state.ak.us, citizens can get just about any government service online — public notices; public safety and criminal justice information; prospecting maps; car registration and personalized plates; state job listings; and fish and game licenses, to name a few.

But Alaska's leaders aren't stopping there. The state's ultimate goal is to roll out a new IP-based network between its central administration building in Anchorage and 38 satellite offices. The ultimate goal: a single IP-based data and voice network connecting all state offices within the next 18 months.

It's an ambitious goal, especially since some of the technology that's needed does not yet scale high enough to handle the thousands of daily calls between the state's 13,000 workers.

For that matter, the IT staff isn't totally convinced of the reliability of the existing telecom system — a series of wireless satellite links and copper wire that enters the state via undersea cable. But state leaders and IT support teams, enticed by the idea of improved efficiency and reduced network management costs, are forging ahead anyway.

The IP network concept dates back to 1998 when Alaska took bids to equip a 19-floor building in Anchorage with a new centralized IP network. The work was completed in late 1998, and the building is dubbed Alaska's "smart building."

Before the renovation, it was nearly impossible for state employees to share data because each department ran its own LAN with no common backbone, hardware or software. Now the 708 state employees in this new facility can access and share files in real time. They also share the costs of network operations.

MPG/ROB STAPLETON

Mark Badger, Alaska's chief technology officer, is preparing to seek bids for a voice-over-IP network.

The new core network, a redundant fiber backbone, Cisco 5509 switches and 8540 core routers, "is really a dream case study of anarchy that has been coaxed into order," says David Adams, a principal at AMC Engineers in Anchorage, the engineering firm that helped design the project. The equipment was installed by the Department of Administration's Information Technology Group (ITG), which also maintains the new network.

The new IP network in the Anchorage administration building is ready for voice over IP, but there are issues to be resolved before Alaska makes the leap to the technology.

First, the state has made a significant investment in existing Nortel Networks telephones and switching equipment. Officials are grappling with how to justify ripping out the Nortel phone gear and reinvesting in IP telephone boxes, software and servers. "We have 13,000 employees. If all those desk sets have to be replaced, there's a certain math to overcome," Poe says.

Reliability

The second issue is the technology. ITG is setting up an IP baseline test across 571 miles of frame relay between government offices in Juneau and Anchorage to see if voice can be carried over its existing communications infrastructure. Once the analysis is complete, the state will issue a formal request for proposal, says Mark Badger, the state's chief technology officer.

"Alaska is very bandwidth-challenged, especially in the winter," says Karen Morgan, deputy director of ITG. "We just had 100 mph winds in the Anchorage bowl area that brought down power lines and caused avalanches. In fact, avalanches aren't all that unusual around here. So in terms of sending voice over IP outside the building, we are proceeding with caution until we can make some better calculations."

Since running voice and data over the same line would halve the number of telephone links into remote government offices, that would mean easier management and repair, even in times of bad weather, Morgan adds: "Voice over IP would cut down the management of multiple links, and would save us time and expense."

Scalability

The state is also waiting for IP telephone equipment to be able to scale to handle thousands of inbound and outbound telephone calls as reliably, or better than, traditional switched telephony.

"Alaska's on the bleeding edge. Reliability and scalability are a major challenge for voice-over-IP service providers and equipment vendors. It's very important that they don't lower the bar of performance," says Tom Valovic, an analyst at International Data Corp., a market research firm in Framingham, Mass.

Hank Lambert, IP telephony product manager for Cisco, agrees. He says it will take Cisco about 18 months to deliver a fully scalable voice-over-IP system.

And with most of these government agencies quite literally out in the boondocks, cost savings on long-distance alone would make the effort worth it, says Stan Hererra, ITG network manager.

But there are other benefits that appeal to Poe. Imagine a voice/video conference call between an emergency medical outpost in, say, Nome, to a cardiologist in Anchorage while an EKG is simultaneously downloaded over the same connection.

Or how about cyberlaw? A defendant in Prudhoe Bay can virtually stand trial while connected to an attorney in Dillingham, the district attorney in Juneau, and a judge in Anchorage. No dog sleds or airplanes needed.

Suddenly, Alaska's 586,412 square miles don't seem like such a big deal anymore.

Radcliff is a freelance writer in northern California. She can be reached at derad@aol.com.

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VoIP mind meld

Find out how voice and data professionals will be working together to deploy voice over IP.

BY SUSAN BREIDENBACH

The coming convergence of voice and data isn't so much a merger of equals as a takeover, with the "net heads" on the rough-and-tumble data side firmly in the driver's seat. To the "Bell heads" on the more orderly and civilized voice side, it's as if the inmates are taking over the asylum. But any organizational shakeup provides opportunities, and enterprising voice professionals are getting ready to seize them.

IT executives view the Bell heads as junior partners in the transition, with the voice world being subsumed by the data side. Voice professionals are regarded as less technologically savvy, and reporting and salary structures tend to reflect this assessment. Meta Group studies show that data professionals get paid 20% to 30% more than their voice counterparts, and for far less experience.

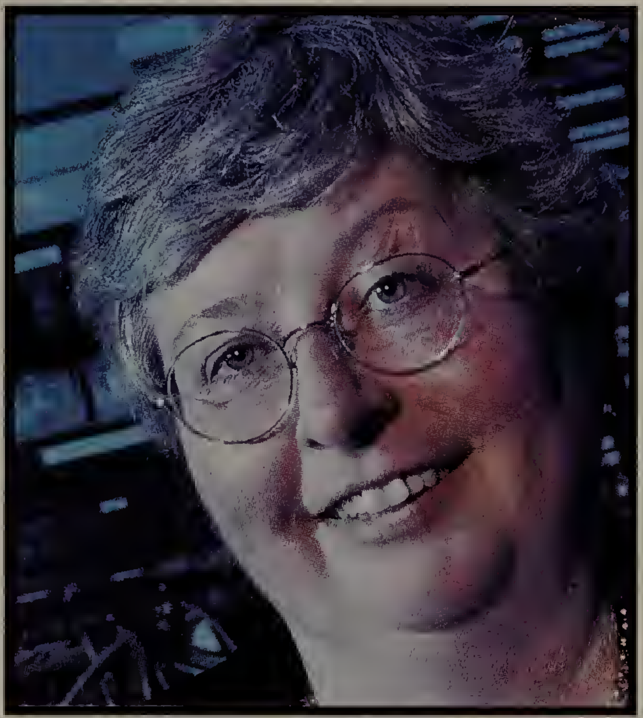
In reality, both sides are underestimating each other and have valuable expertise to contribute.

Rush Presbyterian St. Luke's Medical Center in Chicago is implementing voice over ATM at five remote sites and is also evaluating Cisco's voice-over-IP products. "When you replace regular phones with IP phones, the voice features have to be translated to the data equipment, and it's going to take a lot of collaboration," says Prasad Ravi, director of networks and telecommunications.

Ravi is sending his voice staffers to TCP/IP and voice-over-IP classes, and is having them evaluate IP telephony products.

Rob White, vice president of telecommunications for Home Shopping Network in St. Petersburg, Fla., says, "I am training my telecom installers in data, but I also require my senior data people to learn the voice systems." White sees an opportunity to reduce staffing costs by making better use of certain types of voice specialists.

"Telephone installers get paid half of what a LAN installer gets, and there are a lot more of them," White says. "If we train them, we should see prices go down."


MATT BULVONY

Wendy Noel, telecommunications specialist for NOVA Chemicals in Pittsburgh, says voice specialists should embrace convergence.

The training isn't that difficult, according to IT professionals whose careers have spanned both sides of the house.

"The biggest problem we are running into is a fear factor on the part of the voice people — a flame that data people sometimes try to fan," says Wendy Noel, telecommunications specialist for NOVA Chemicals in Pittsburgh. "But I look at them and think, 'I was running networks before you were out of diapers, so don't tell me I can't do it.'"

In fact, voice folks should look forward to the new order with confidence. "Data engineers tend to be one-trick ponies who can only discuss one aspect of the network, while voice people are generalists. It's easier for us to embrace the data world because we've always had to be more flexible," Noel says.

People skills are another strength that telecom professionals can take advantage of.

"A lot of data people have never had to deal with a user before," says Elizabeth Ussher, a program director for Meta Group in Atlanta. "The voice people have a customer-service type of mindset that sets them apart from the data side."

NOVA Chemicals has been able to use this mindset as teams of data and voice people work together to develop telecommuting and mobile-computing plans for users who don't have an IT staff on site. "The data engineers come up with all this whiz-bang technology, but it's the voice people who provide the reality check and make sure that ordinary people can use it," Noel says.

While convergence won't happen overnight, now is the time to prepare for it. Professional organizations such as the International Nortel Networks Meridian User Group (INNMUG) provide a good place for voice workers to get started.

"I've been involved with INNMUG for 10 years, and this experience has helped me improve my leadership and presentation skills and strategic thinking," says Jean Wilson, telecommunications director for Vistana Resorts in Orlando and an INNMUG director. "There is so much information you acquire from networking with others that you can't get in a classroom."

Likewise, Meta Group's Ussher advises companies to bring their voice and data people together in brown-bag lunch meetings.

"We have an aggressive education program, and we've been cross-training voice technicians and moving them over into the data engineering group," says Virgil Palmer, director of global communications and networking services for Air Products & Chemicals in Allentown, Pa.

Switch vendors and carriers sometimes offer free courses on TCP/IP and voice-over-IP, while training firms, colleges and universities offer more extensive instruction. Also, INNMUG and other professional groups host conferences that include educational programs.

Finally, Bell heads can supplement their training with some hands-on experience. Home Shopping Network's White recommends experimenting with a small IP-based voice system. Evaluation units are often available free from vendors.

Breidenbach is a consultant and freelance writer in San Mateo, Calif. She can be reached at sbreide@aol.com

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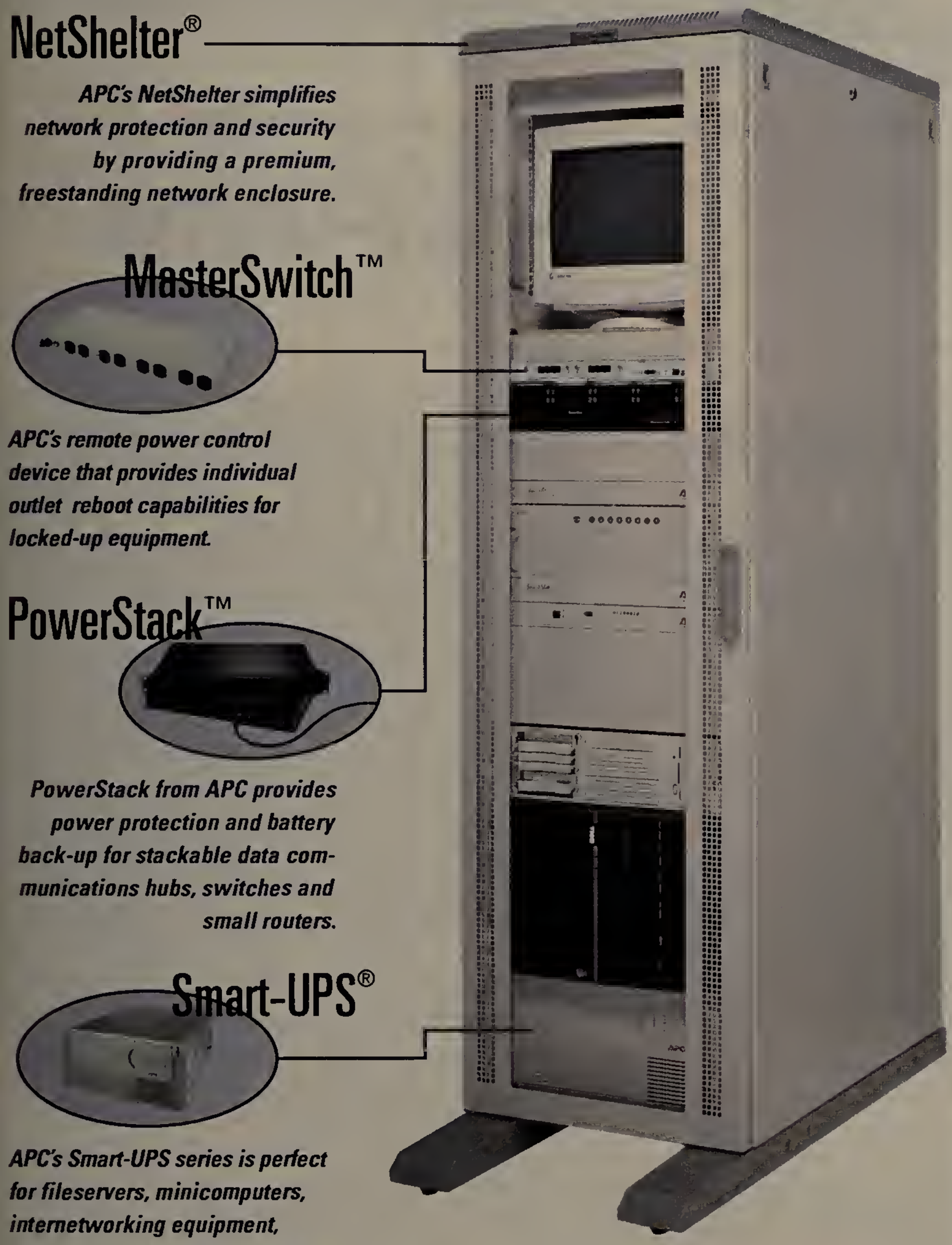

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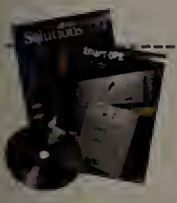

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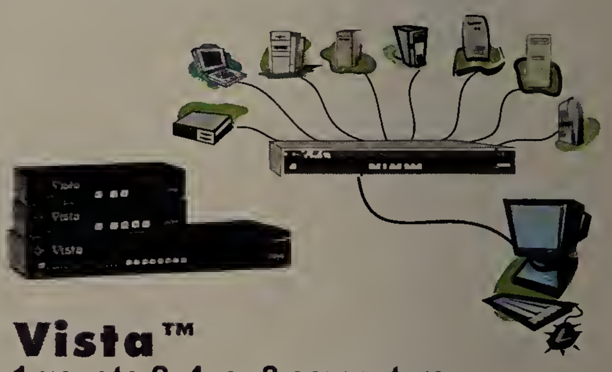

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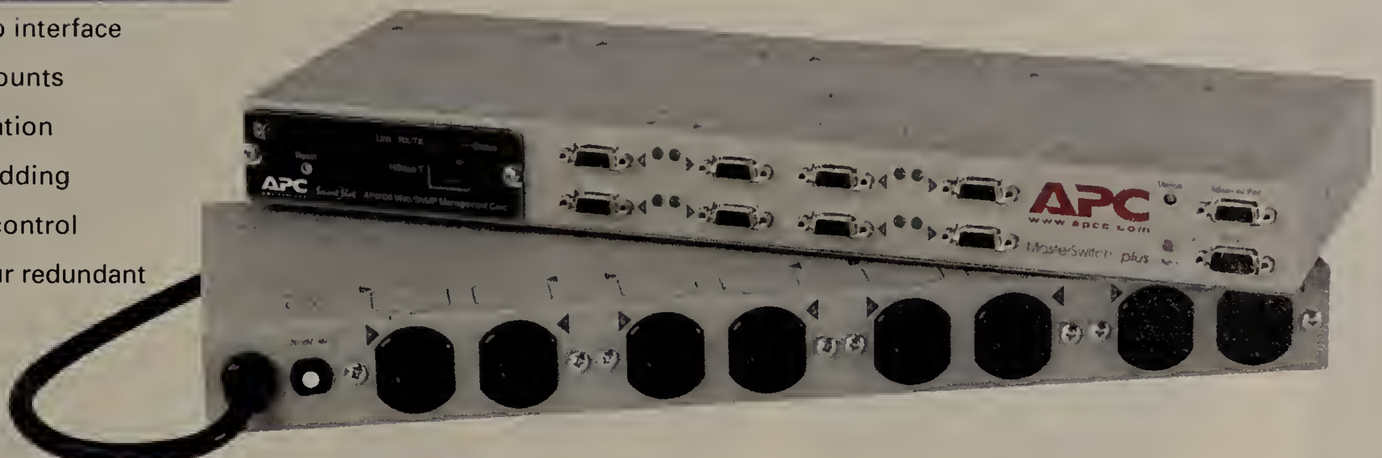

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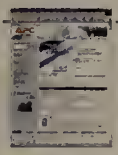

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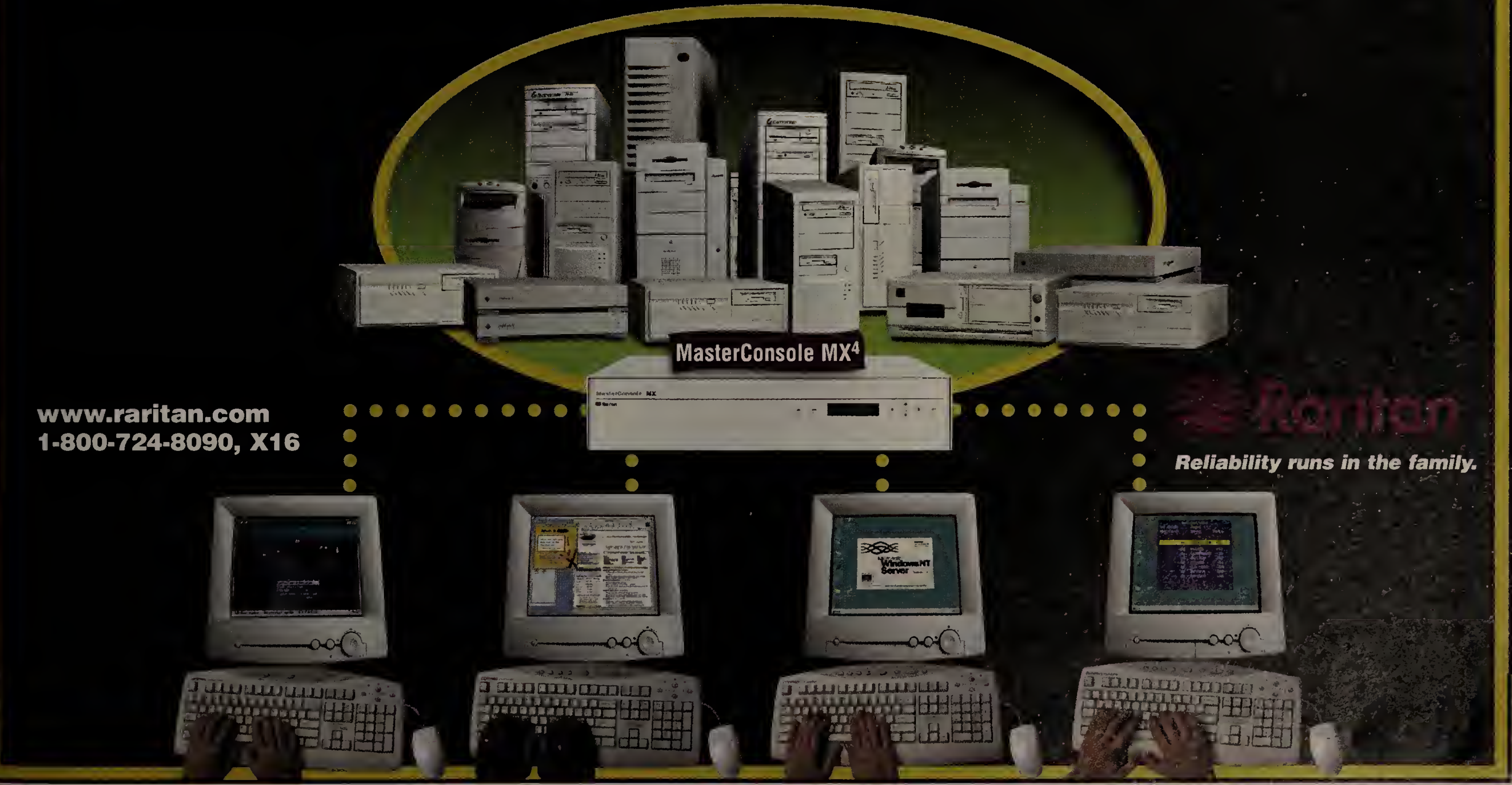

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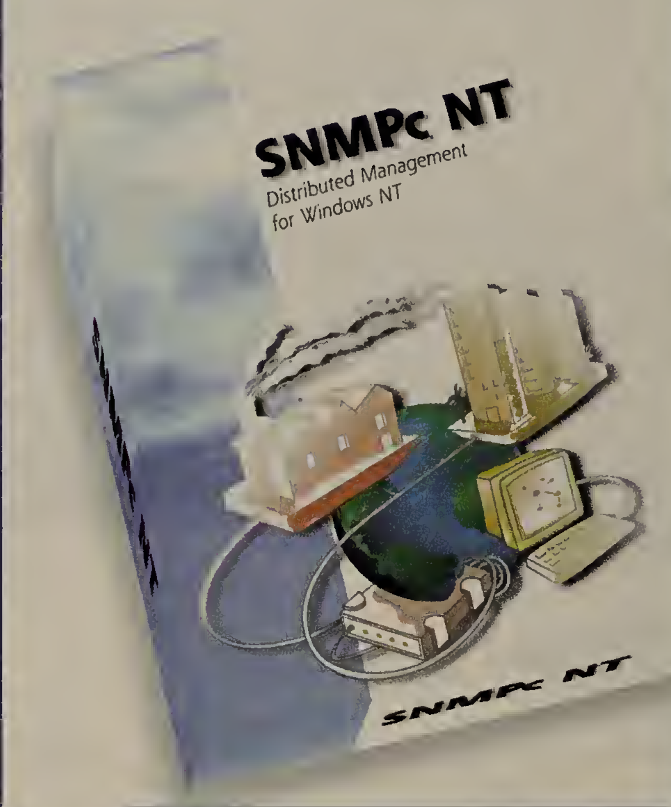

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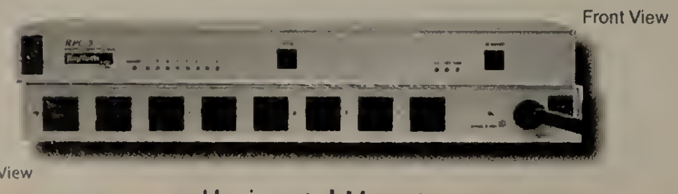

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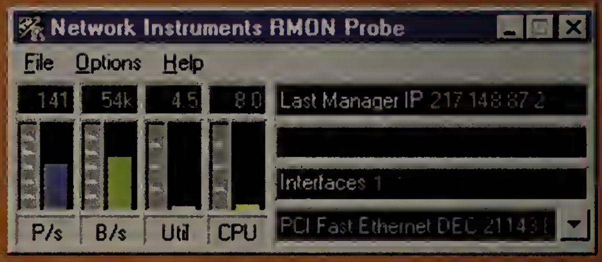
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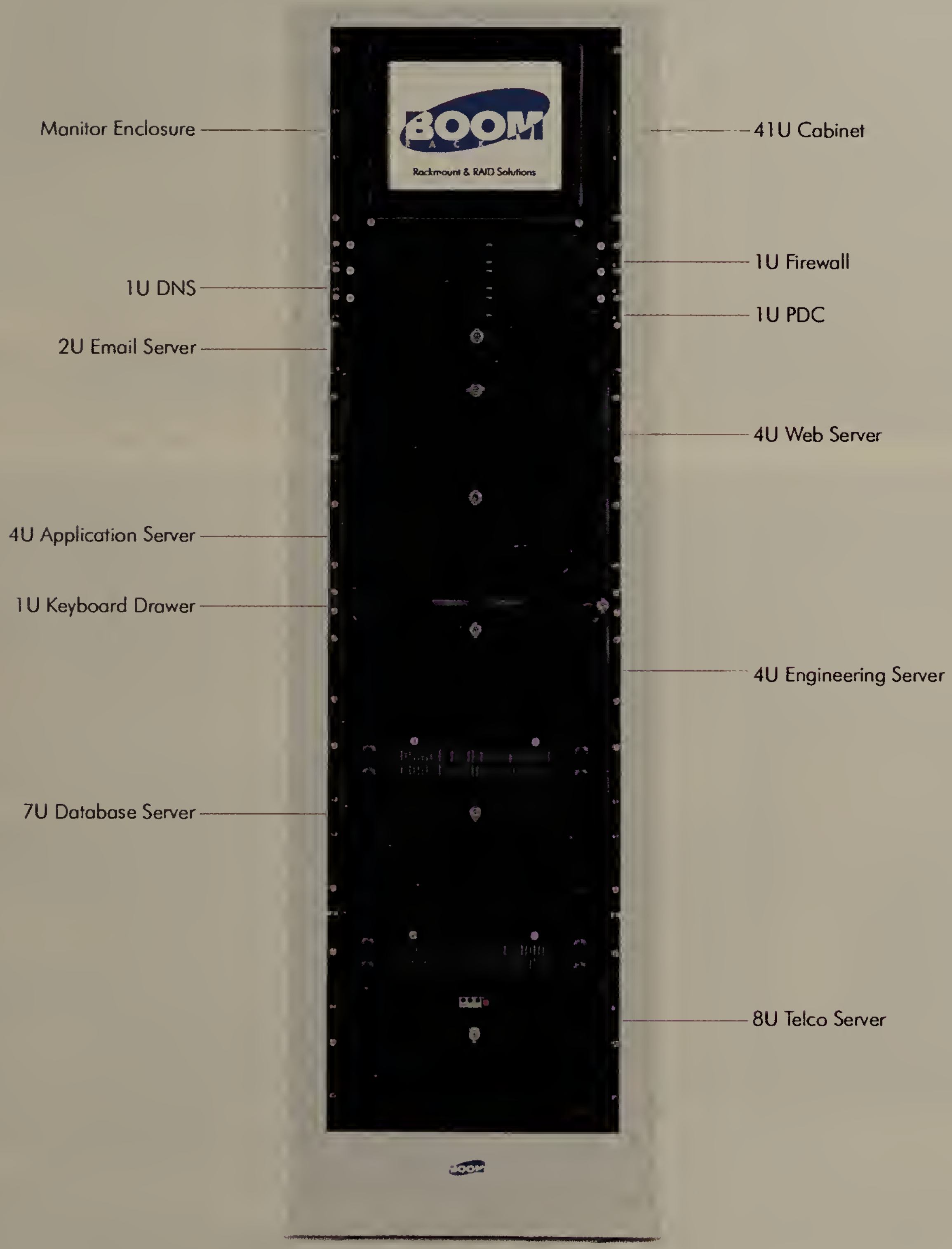

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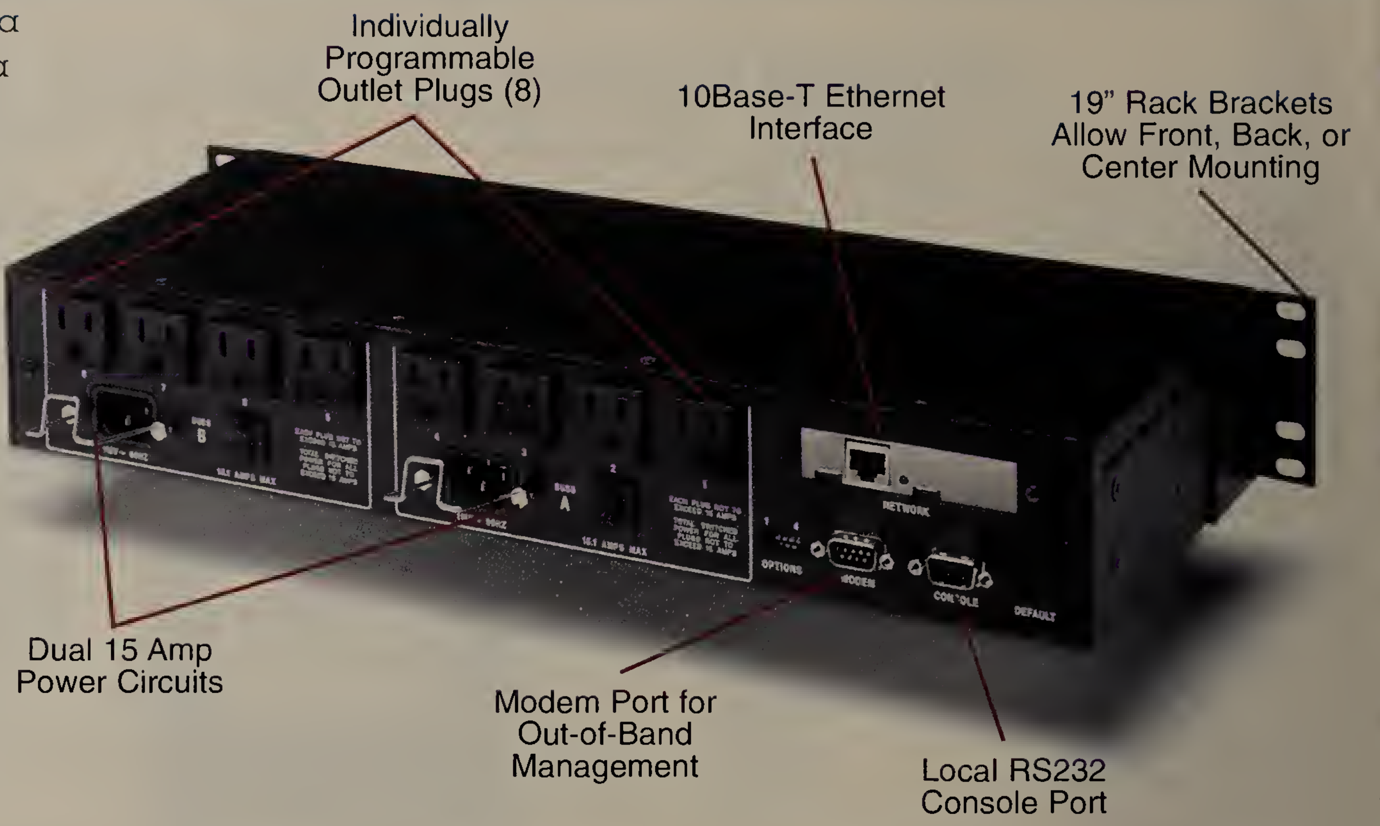
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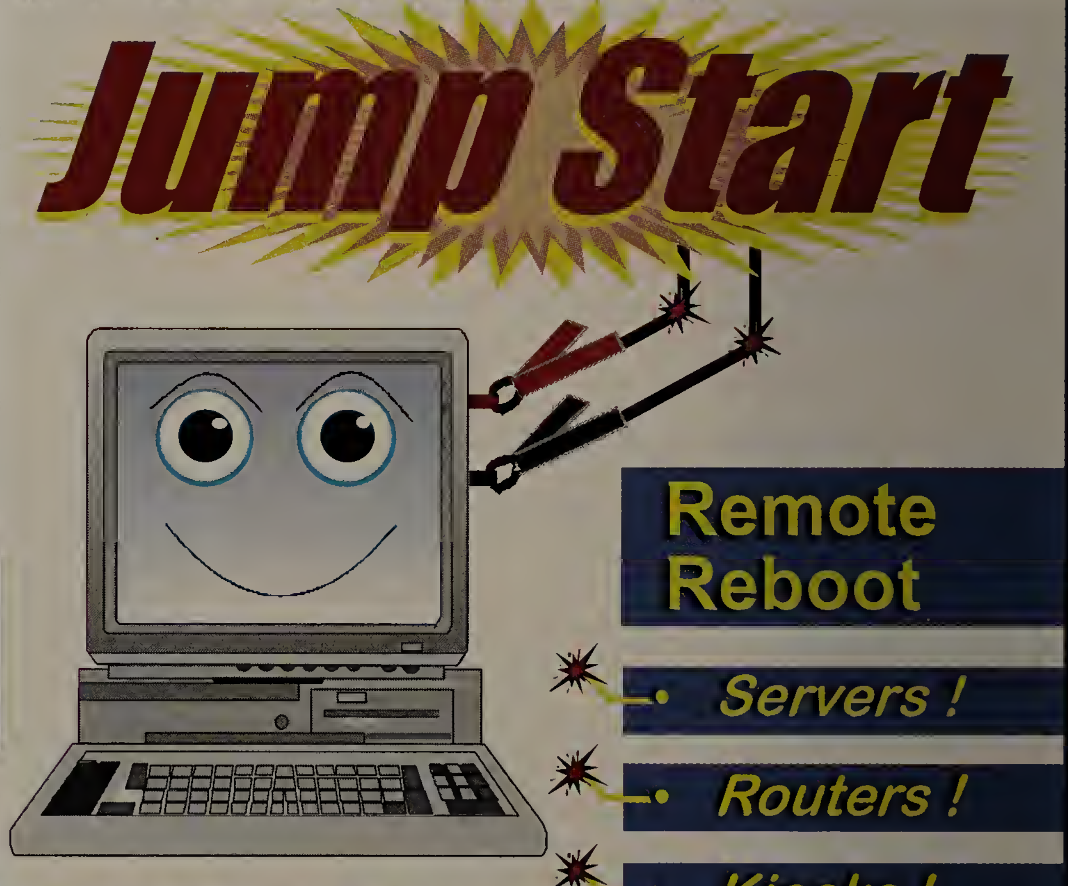

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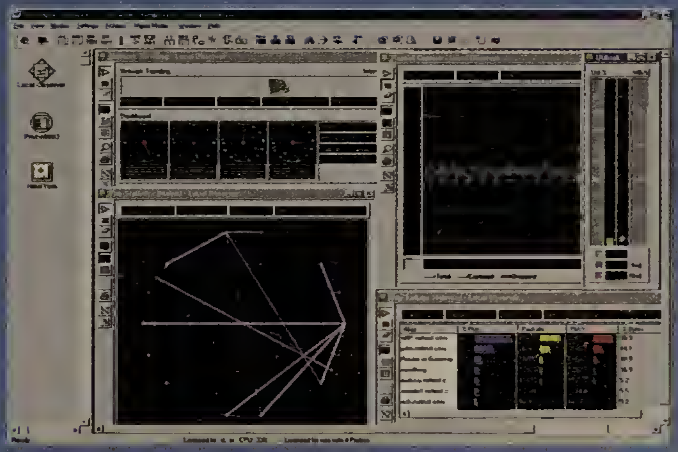

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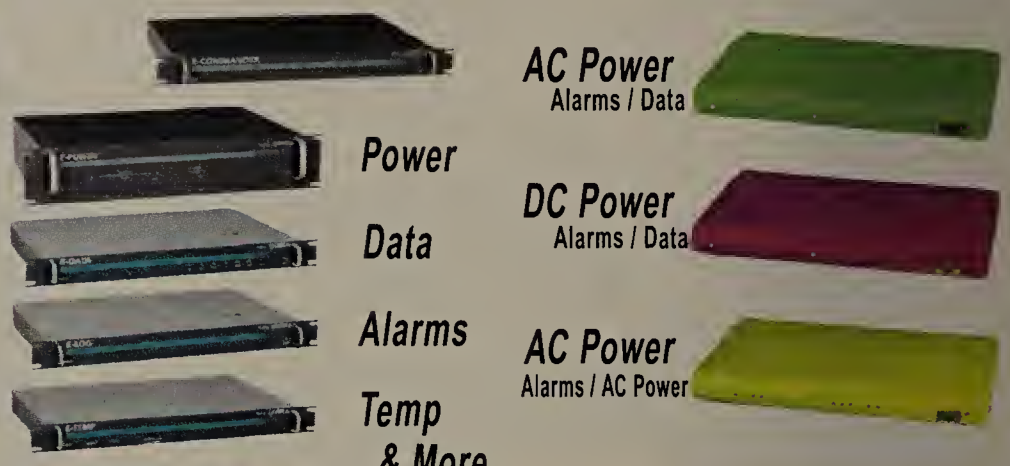

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- Java, ORACLE, HTML, NT. MS CS/Eng'g or related discipline.
- Cold Fusion, Samba, VB, NT. MS CS/Eng'g or related discipline w/1+yr exp.
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- ORACLE, SOL, VB, UNIX. MS CS/Eng'g or related discipline.
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- VSAT, Multiplexers, Switches. BS CS/Eng'g w/5+yrs exp or MS CS/Eng'g w/2 +yrs exp.
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- DACCS, Multiplexers, SONET or SDH. BS CS/Eng'g w/2+yrs exp.

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- ORACLE, SQL, Windows NT. CS/Eng'g or related discipline w/2+ yrs exp.
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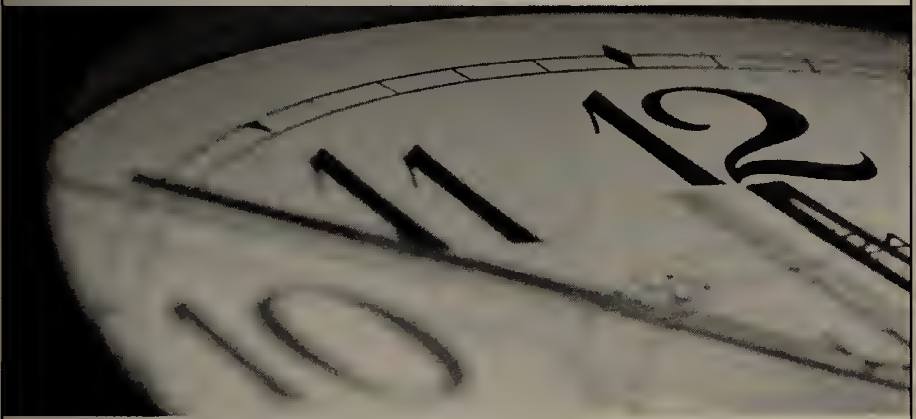

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Programmer/Analyst (Atlanta, GA and other US client sites). Analyze user requirements; design, develop, enhance & maintain systems using SAP applications. Environment: SAP R/3,ABAP/4.Bachelors degree any major +2 yrs exp in job off'd. 40 hrs/wk; 8:30-5:30; $270 K/yr. Send resume to Colorado Dept. of Labor & Employment; Employment Programs, ATTN: Jim Shimada, Two Park Central, Ste 400; 1515 Arapahoe St.; Denver, CO 80202, Job Order No. CO 4648311

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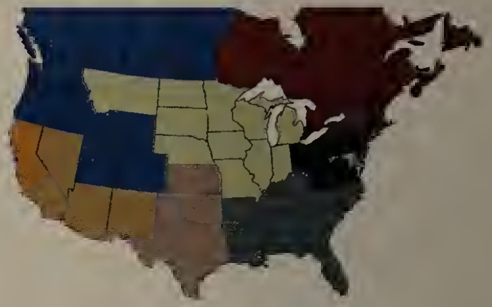

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Exodus,
continued from page 1

new requests come in.

The ArrowPoint switches route requests based on server availability and the nature of the content being requested using URL addresses, which speed transactions and balance server workloads. The Exodus/ArrowPoint combination should help users more efficiently distribute everything from Web pages and large files to graphics-rich content and streaming video.

The firms will also announce an agreement in which Exodus users will be able to buy ArrowPoint switches, service and support through Exodus, eliminating the need for customers to have to deal with multiple vendors as they set up e-commerce sites. By hosting content on Exodus clusters, users can free up their main Web servers to handle dynamic requests, such as transaction processing, and rid themselves of supporting their own server farms and networks.

Observers say Exodus' managed services enhancements are a response to the explosive growth in e-commerce and the demands it places on networks and servers. A recent *Network World* survey of 500 companies indicated that they expect a whopping 40.8% of their revenue to be derived from e-commerce within two years. The same companies also expect that two years from now the median amount of money dedicated to their e-commerce sites will be $4 million. Meanwhile, the worldwide Internet caching market, including service providers, is expected to grow from $269 million in 1999 to nearly $2.2 billion in 2003, according to Internet Research Group of Los Altos, Calif. Enterprise sales are expected to increase from $110 million to $1.4 billion.

ArrowPoint's CS-100 will front-end the Exodus ReadyCache service.

"Our traffic has grown tremendously — sixfold since last year," says Peter Park, lead digital architect for retailer Sharper Image. He says the company went to Exodus for Web hosting for its auction and products Web sites, and for the comprehensive set of services Exodus could provide to maintain those sites. Sharper Image uses ReadyCache for many of the graphics-intensive images on its Web site, reserving its main servers for dynamic content serving.

Park says Exodus' ability to fully integrate Sharper Image's e-commerce sites and provide distributed content services all on its own network were a big factor in choosing Exodus and ReadyCache.

Park said that he would have hesitated to use a separate content distribution company: "With a third party, we wouldn't have been as willing to go this way because it would have taken too long to implement and execute."

Exodus isn't alone in its quest to offer high-demand strategic cache services. Akamai, Sandpiper Networks and Digex are also offering distributed content services, but aren't as big in the Web hosting arena as Exodus, says Courtney Munroe, an analyst with IDC, a consultancy in Framingham, Mass.

"Exodus has a very good chance of succeeding in these types of managed services because they are building data centers faster than anyone else and also in terms of being able to actually deliver managed services on time. They are one of the few who can," Munroe says.

Exodus Internet Data Centers typically support multiple OC-3 and OC-12 links providing an Internet data exchange rate of more than 7.2G bit/sec, the company claims. ◪

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Lucent,
continued from page 1

original company. Other WAN-edge devices coveted by carriers for their managed enterprise services will also remain.

The move will leave users — who have been waiting for a concerted Lucent effort to sell voice and data services in a single package — with the likelihood of having to deal with two vendors rather than one for their network needs.

Nevertheless, customers generally said they expect the new company will be able to focus more squarely on integrating Web commerce with telephony call centers because of the spin-off's call center hardware and software focus. And they expressed hope that Lucent's Cajun line of Ethernet and ATM switches will take center stage over the optical network gear Lucent has been concentrating on.

Lucent CFO Donald Peterson to head new company.

Lucent boasted that the new company is No. 1 or 2 in most of its markets. But in the LAN switching arena, the new company is rated No. 10 by IDC, with only 1.3% of the ports shipped worldwide and 1.9% of the worldwide revenue in 1999.

In fact, of the $8 billion in revenue represented by the enterprise spinoff, the large majority is PBX and call center-related, estimates IDC analyst Esmeralda Silva, with the LAN switching line contributing only $270 million in 1999. And that pairing hasn't paid many dividends, she says: "It's unfortunately still the case that having PBX expertise does not mean you're going to be able to sell LAN switching systems into the enterprise networks."

Cisco leads the market, with 39.2% of the LAN ports shipped in the highly fragmented market. 3Com has 18.8%, and Lucent's PBX archrival Nortel Networks has 11.1% owing to its Bay Networks acquisition. Silva says the Lucent spinoff may try to reposition the Cajun line as ideal for e-commerce data centers — not only at enterprise customers but also for hosting companies and application service providers — and could attempt alliances or acquisitions with others emphasizing e-commerce infrastructure.

Lucent's lackluster enterprise network sales problem can be traced to a lack of a strong marketing push of the company's workgroup Cajun P120 and P220 switches, says Lucent user Joe Inzerillo, director of technical operations for the United Center in Chicago. The United Center not only is the Chicago Bulls' basketball arena but also operates a shared network among several stadiums and practice facilities.

"I think they could do a little bit better on the pricing, and they really need to be selling the upgrade story," Inzerillo says. The United Center uses the campus-class Cajun P550, which is "unbelievable — much better than anything else on the market," he says. But the LAN switching line has lost market visibility ever since Lucent bought ATM and IP remote-access powerhouse Ascend Communications last year, Inzerillo says.

Patric Brayden, president of the International Definity Users Group — Lucent's main user organization — says he's been assured by Lucent executives that the new company will obtain agreements to resell the WAN-access products Lucent will keep. Brayden, who is network services manager at Group Health Cooperative in Seattle, says the spinoff may have an easier time focusing on a convergence story than Lucent: "It's better to have the leadership focused in one direction or the other."

Donald Peterson, current chief financial officer of Lucent, who is slated to be CEO of the spinoff, told *Network World:* "I think you'll see some shared intellectual property between us and Lucent." Much of the WAN-edge equipment that is staying with Lucent (see graphic) originated at either Ascend or VPN pioneer Xedia, both of which Lucent acquired in 1999. Those products are generally growing 50% per year, Lucent officials say, while some of the product lines going into the spinoff are growing at single digits. ◪

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Breaking up is hard to do

Although Lucent cautions that the precise lineup may change, the following key products and services for users are slated to wind up in different companies:

Going to enterprise spinoff

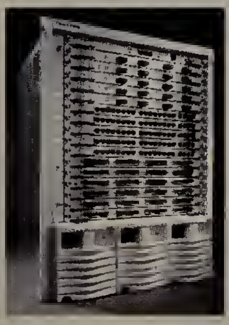
Cajun family of LAN switches
Ethernet, ATM and multifunction switches and switch/routers.

CRM Central 2000 and Siebel Systems alliance
Web-enabled call centers and customer relationship management software.

Definity Enterprise Communications Server
Main PBX and call center platform.

IP Exchange Systems and Definity IP Solutions
IP telephony platforms.

Systimax cabling
Structured wiring.


Lucent will unload its LAN switching products, including the Cajun P880 . . .

Staying with Lucent

AccessPoint 450, 1000 and QVPN Builder
IP access routers with security and QoS for IP VPNs.

ClearTrac family
Frame relay access devices with SNA and voice support.

Lucent VPN gateway
VPN hardware appliance with a built-in firewall.

MAX WAN Access Switches
High-capacity remote access concentrators.

SuperPipe 95 and 155
Multiservice access devices for branch offices and telecommuters.

. . . but keep all VPN gear, such as the AccessPoint VPN router.

Surfing,
Continued from page 1

The phenomenon has a growing number of corporate network professionals monitoring or blocking such sites because they violate Internet usage policies, create security risks and distract workers from doing their real jobs.

The number of surf-for-cash sites has mushroomed in recent months, with at least 70 sites currently online or in beta test mode. The sites run the gamut from AdPerks.com, which pays users to view online ads and visit advertiser Web sites, to Zupermail.com, which pays users to read and respond to e-mail from advertisers. Especially popular are sweepstakes sites such as iWon.com, a portal that awards daily cash prizes to its members.

Many surfing on the clock

Although they are geared toward consumers, these sites are attracting many on-the-job users. For example, iWon.com was one of the top 10 sites where employees spent the most amount of time during the month of January, according to a survey of at-work Internet usage by Nielsen/NetRatings. The 7,000 employees in the survey spent an average of 67 minutes at iWon.com during January.

"It's only recently that we've seen these sites becoming an area of concern," says Ivan O'Sullivan, president of Elron Software, a Burlington, Mass., manufacturer of software that monitors employee Internet usage. Within six months, "I expect to see these sites emerging in the top 10 areas of inappropriate Web usage."

Eric Schmidt, chief information officer at Bricker & Eckler, a Columbus, Ohio law firm, began blocking surf-for-cash sites in November after receiving an influx of e-mails hawking membership benefits. Schmidt uses Elron Software's Internet Manager to block these sites as well as pornography, gambling and music sites.

"There are a tremendous number of moneymaking sites," Schmidt says. "We try to block the most popular ones and take care of the rest through education."

Brickler & Eckler forbids inappropriate and nonbusiness-related Internet usage. The firm also prohibits employees from running a business using corporate resources. Nonetheless, Schmidt recently sent an e-mail to the firm's staff reminding them that surf-for-cash sites are off-limits.

"Going to these sites is a very tempting thing to do. People say they can earn anywhere from $5 to $500 a month," Schmidt says. "I try to gently remind them that going to these sites is wasting the firm's resources."

Surf-for-cash sites are among those that American Superconductor, a Westborough, Mass., research and development company, will track with its new CyberPatrol monitoring and blocking software, says Ross Gibson, vice president of corporate resources. American Superconductor requires its 275 employees to sign a policy prohibiting inappropriate, excessive and profit-making Internet use before they are given access.

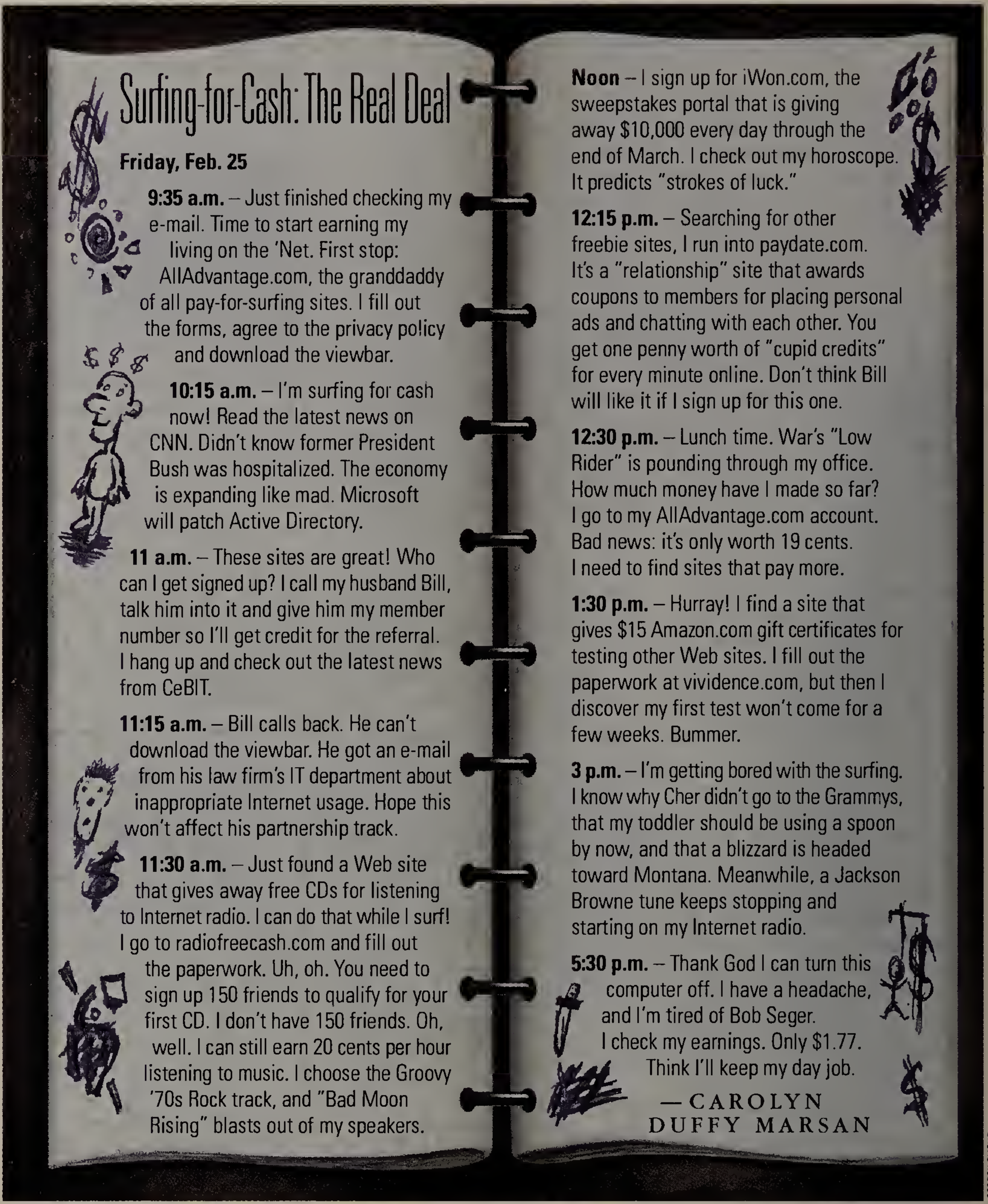
"These sites would clearly be out of bounds during work hours," Gibson says, adding that the company may block the sites altogether if usage is excessive.

Multiple headaches

Surf-for-cash sites cause several headaches for network executives:

- Many sites require downloadable client software, which can cause support problems on standardized corporate desktops.
- Some sites are a minor network bandwidth drain because they provide a steady stream of graphics-intensive banner ads to the desktop, while carrying encrypted information about the user's surfing behavior back to the site.
- Many companies consider information about where their employees surf to be proprietary, in which case these sites represent a security breach.

"Companies don't want to give out information about where their employees are surfing," says Jonathan Penn, a senior industry analyst with Giga Information Group in Santa Clara. "Microsoft was not pleased when Amazon.com showed the top book picks by



Surfing-for-Cash: The Real Deal

Friday, Feb. 25

9:35 a.m. – Just finished checking my e-mail. Time to start earning my living on the 'Net. First stop: AllAdvantage.com, the granddaddy of all pay-for-surfing sites. I fill out the forms, agree to the privacy policy and download the viewbar.

10:15 a.m. – I'm surfing for cash now! Read the latest news on CNN. Didn't know former President Bush was hospitalized. The economy is expanding like mad. Microsoft will patch Active Directory.

11 a.m. – These sites are great! Who can I get signed up? I call my husband Bill, talk him into it and give him my member number so I'll get credit for the referral. I hang up and check out the latest news from CeBIT.

11:15 a.m. – Bill calls back. He can't download the viewbar. He got an e-mail from his law firm's IT department about inappropriate Internet usage. Hope this won't affect his partnership track.

11:30 a.m. – Just found a Web site that gives away free CDs for listening to Internet radio. I can do that while I surf! I go to radiofreecash.com and fill out the paperwork. Uh, oh. You need to sign up 150 friends to qualify for your first CD. I don't have 150 friends. Oh, well. I can still earn 20 cents per hour listening to music. I choose the Groovy '70s Rock track, and "Bad Moon Rising" blasts out of my speakers.

Noon – I sign up for iWon.com, the sweepstakes portal that is giving away $10,000 every day through the end of March. I check out my horoscope. It predicts "strokes of luck."

12:15 p.m. – Searching for other freebie sites, I run into paydate.com. It's a "relationship" site that awards coupons to members for placing personal ads and chatting with each other. You get one penny worth of "cupid credits" for every minute online. Don't think Bill will like it if I sign up for this one.

12:30 p.m. – Lunch time. War's "Low Rider" is pounding through my office. How much money have I made so far? I go to my AllAdvantage.com account. Bad news: it's only worth 19 cents. I need to find sites that pay more.

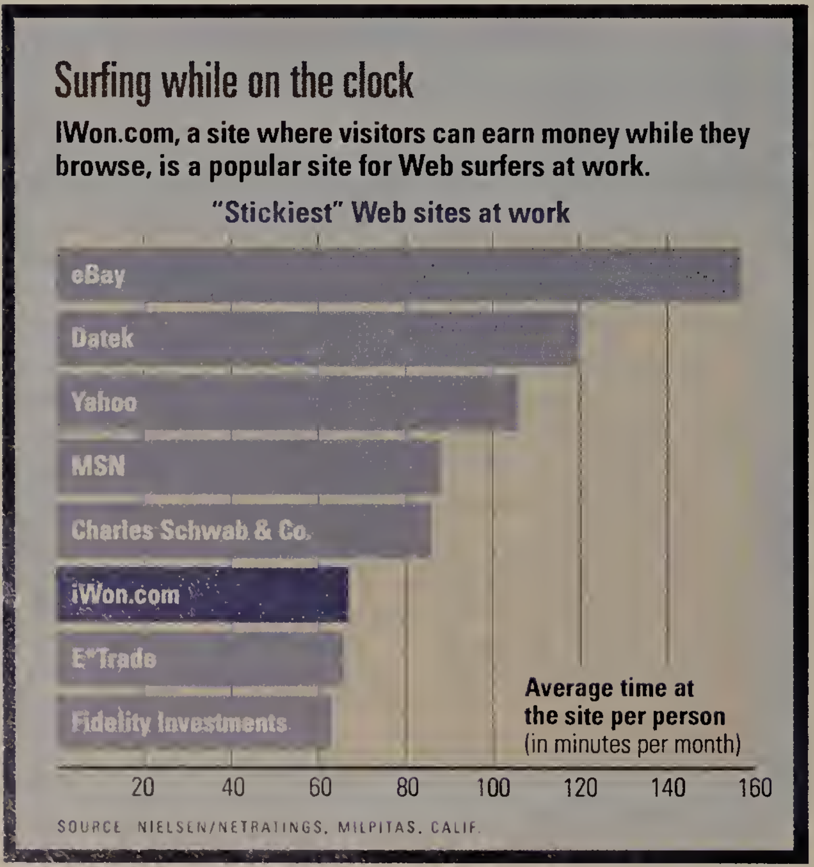
1:30 p.m. – Hurray! I find a site that gives $15 Amazon.com gift certificates for testing other Web sites. I fill out the paperwork at vividence.com, but then I discover my first test won't come for a few weeks. Bummer.

3 p.m. – I'm getting bored with the surfing. I know why Cher didn't go to the Grammys, that my toddler should be using a spoon by now, and that a blizzard is headed toward Montana. Meanwhile, a Jackson Browne tune keeps stopping and starting on my Internet radio.

5:30 p.m. – Thank God I can turn this computer off. I have a headache, and I'm tired of Bob Seger. I check my earnings. Only $1.77. Think I'll keep my day job.

— CAROLYN DUFFY MARSAN

BALVIS RUBESS



Surfing while on the clock

IWon.com, a site where visitors can earn money while they browse, is a popular site for Web surfers at work.

SOURCE: NIELSEN/NETRATINGS, MILPITAS, CALIF.

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its employees."

The sites also have clear business implications, such as lost productivity for workers and use of company resources for personal financial gain. In fact, legal experts say companies may be able to claim profits or prizes employees receive from sites accessed via company-provided PCs.

"A lot of companies have employment agreements that would potentially cover these sites," says Mike Overly, a partner with Foley & Lardner in Los Angeles and author of "E-Policy," a 1999 book on Internet usage policies. "These policies say that if you use our resources or technology in developing something else or generating profit, we own it."

Overly says he's received several calls in the past two months from corporate clients asking whether their existing Internet usage policies cover surf-for-cash and other moneymaking Web sites. He says well-written policies prohibit commercial use of Internet connections and address employee productivity.

"These sites are popping up all the time, which makes it very difficult to block them," Overly says. "Businesses are having to rely on their Internet usage policies to police this problem."

Popularity on the rise

Surf-for-cash sites are gaining popularity because they are raking in venture capital funding and cranking up their membership drives. AllAdvantage.com, the leading surf-for-cash site with five million members, last month received a $100 million investment led by Softbank Capital Partners. The Hayward, Calif., company also filed to go public.

"These sites require a critical mass of about one million members" in order to attract vendors and bargain for discounts, says Chris Yeh, chief marketing officer of competitor ClickDough.com of Santa Clara. Yeh says the assets of surf-for-cash sites are the e-mail addresses and personal information about their members. The more members a site has, the higher its valuation by the investment community, he explains.

Members of surf-for-cash sites can earn anywhere from $5 to $75 month — in cash or coupons — based on their own surfing. But the big dollars come from signing up other members and earning a share of their usage.

"We had a dozen people earn more than $1,000 last month," says John Ferber, co-founder and chief Internet officer of the Columbia, Md., company Advertising.com, which runs GetPaid4.com. "Some people are trying to earn a living doing this." ◪

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Tips on monitoring Web usage

1 With the help of your human resources and legal staffs, develop a written Internet usage policy that is broad enough to encompass new types of Web sites such as surf-for-cash sites. Be sure the policy forbids inappropriate, excessive and profit-making activities.

2 Communicate the policy to all employees. Require them to sign it. Regularly update them on new Internet-related issues.

3 Tell employees that you will be monitoring their Internet usage and explain why.

4 Buy an Internet usage-monitoring product to track what sites your employees visit most frequently and how much time they spend on the 'Net.

5 Monitor usage for a while before you block access to problematic categories such as pornography, gambling, shopping and surf-for-cash sites. Develop a Top 10 list of regularly visited sites to help you keep up with new threats.

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Backspin

Nut behind the support call

MARK GIBBS

What an irritating evening! After a long day, I sat down with a cup of tea to write "Backspin" and managed to dump the tea all over my desk. After a bout of furious mopping, the result was a much cleaner desk but a keyboard on which the "o" and "d" refused to work.

So, I had to shut down the machine, find another keyboard, plug it in, restart the machine and endure yet another interminable boot-up (ya gotta love that Windows boot-up). I guess I should be pleased to have to restart the machine for a reason other than my usual ones — normally I find myself rebooting because either Windows 98 has tanked for some bizarre reason or my display has frozen.

I wrote about the frozen display phenomenon in a previous column ("What I want for Christmas," *NW*, Dec. 20, 1999, page 58), after which a Hewlett-Packard chap got in touch and turned their tech support on to me. The support tech concluded that I was short on RAM — interesting, because the machine comes with 96M bytes, but that's apparently not enough.

Be that as it may, I finally upgraded my RAM a couple of weeks ago and everything seemed OK. Now, when I write "upgraded," I'm serious: I now have 384M bytes, which should be enough even for a memory hog like Windows 98. Unfortunately, more RAM hasn't solved my problem — frozen displays are still part of my computing experience.

Curiously, just after the last time I wrote about this, I got a note from Bruce Stratman, who suggested: "Because you can cause your display to freeze, you are well-positioned to test possible fixes. You probably have already tried this [actually, I hadn't], but don't overlook the obvious. Throttle back the hardware acceleration function in the Win98 video display driver settings. I suggest turning it off to verify this fixes the problem, then inching forward until the problem manifests itself, then back one notch. This will fix most video freeze issues."

Stratman hit the nail on the head! I switched off hardware acceleration completely and the freezing problem stopped. Let joy be unconfined! (Thanks Bruce!) Of course, if you drag a window across the screen it looks awful — a trail of window frames appears behind the window you're dragging, and there's a noticeable lag in repainting some application screens.

Of course, I have yet to inch acceleration forward, as I would have to reboot the damn machine each time, and with the boot-up delay, we're looking at a long, long session.

So, I have now entered a new zone of dissatisfaction with my PC. I bought the machine because it was priced right, had a Pentium III running at 450 MHz and had hardware graphics acceleration. Turning off hardware acceleration is an insane (albeit effective) solution.

Looking back on the exchange with the support tech, I bet he classified my call as "NBW" (Nut Behind Wheel). NBW is, I believe, an old joke that goes back to the early days of motorcars. Even so, it has gained a whole new lease of life in the computer business to describe clueless users.

And while it is true that users can be curiously brain dead, I think many of us who deal with them fall into the thinking that all unobvious problems, that is, problems that don't fall into an obvious category, are explicable as being caused by some simpler problem.

So, in the case of my call to HP tech support, my problem must have been not enough RAM because there was no category of solved problems labeled "frozen display." Let's tell him to get more RAM and file his inquiry away as NBW — next!

Memo to HP: Expect a call from me real soon, and do not even think NBW.

Are your assets frozen? Thaw 'em at nwcolumn@gibbs.com.

'NET BUZZ

The latest on the Internet/intranet industry

PAUL MCNAMARA

Buzz is salivating this week because **Boston.com,** a popular portal in these parts, has added a new entrée to its menu: **OpenTable.com.**

A San Francisco-based start-up, OpenTable has already signed up some 320 restaurants in the Bay Area, Seattle and Chicago to be part of an online reservation network the company expects will mushroom into the thousands by year-end, says **CEO Chuck Templeton.**

Given that the dot.com landscape is littered with junk food these days, online restaurant reservation systems such as Templeton's stand out like a gourmet meal. No more waiting for a restaurant to open so you can stake your claim to a prime Saturday night slot. No more being at the mercy of a harried restaurant hostess with bad phone manners. No more settling for Chinese take-out.

Templeton says his salespeople, after encountering initial reluctance, are having no trouble selling restaurateurs on the value proposition.

"Six months ago we did, but now everyone is welcoming us with open arms," he says. "It's been quite a dramatic shift."

OpenTable is a soup-to-nuts operation, too. They'll equip an eatery with hardware, software, setup services and a digital subscriber line (DSL) connection for about $1,000, plus a monthly fee of between $200 and $400. Templeton figures his network needs to drive only a few new customers per week to his clients for those restaurants to realize a return on their investment.

The venture hasn't been all peaches and cream, Templeton admits.

"It's a more difficult business to build than I thought it was going to be because there is so much infrastructure," he says.

For example, landing DSL lines can be more difficult than finding fresh seafood in some places. "In New York, it's not moving as fast as we'd like," he says.

In New York, of course, a lot of things don't move as fast as we'd like.

Last week we wrote about how certain e-mail addresses — firstname@successfulcompany.com — can be an indicator of great personal wealth. Reader John Hiett offered this anecdote in response:

"Back about 10-plus years ago, I could send e-mail directly to **Bill Gates** via bill@microsoft.com," Hiett says. "He answered me a few times, and we discussed Microsoft Flight Simulator.

"By the early '90s, it got to where I had to e-mail him via a proxy, but I still got answers. Now — fat chance. I figured the last time he wrote me it cost about $4,500 for him to type the message."

As a relative latecomer to the technology world myself, I normally avoid poking fun at newbies or the outright clueless. An exception will be made for **President Clinton,** however.

According to Reuters, Clinton was visiting a computer class in a senior center when he encountered a display of technology so impressive he was heard to utter this single superlative: "Amazing."

And what was the object of this presidential awe?

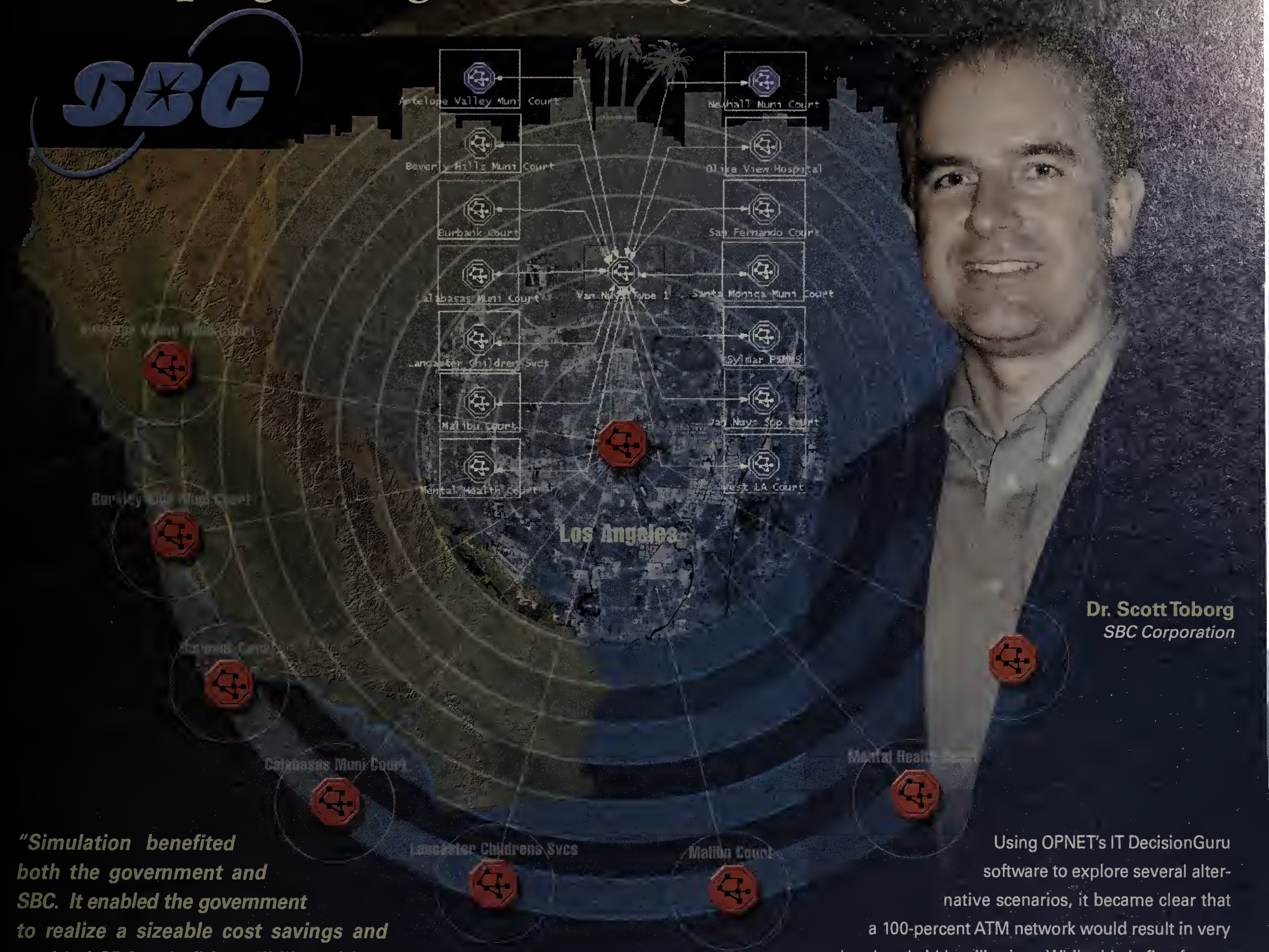
A screen saver.

Two thoughts: The episode shows again how isolating a long stint in the White House can be. And, clueless or not, I'll bet this president has no problem finding porn on the Internet.

Sometimes a year can seem like a decade — think about the eighth grade. Other times, a year can whiz by faster than a three-day holiday weekend. Example: You are reading the 52nd 'Net Buzz column to flow from these fingertips.

What has made the experience a lot more fun than junior high — at least on my end — is the e-mail readers send in response to these weekly ramblings. With the possible exception of a big, fat paycheck, nothing warms the heart of a columnist like a letter from a reader . . . even the ones that start, "Dear idiot." So please keep 'em coming. That address once again: buzz@nww.com.

Developing a Large-Scale, High-Performance Intranet



Dr. Scott Toborg
SBC Corporation

> *"Simulation benefited both the government and SBC. It enabled the government to realize a sizeable cost savings and enabled SBC to build credibility with government decision makers — and perhaps even win the contract — by providing quantifiable documentation that we could deliver the network service levels as promised."*

"Pacific Bell, a subsidiary of Southwestern Bell Communications (SBC), was asked recently by a local government in Southern California to develop a communications network capable of supporting more than 80,000 employees at dozens of sites. The network would support multiple data, video, and voice applications and would have to be extensible enough to support thousands of additional users should the government's needs increase.

SBC's rough initial estimates suggested that the network should be built on top of an ATM OC-3 backbone running between five primary data centers. Either ATM OC-3 or ATM DS-3 connections would then link the backbone to 57 other locations. Such a network would carry an immense price tag.

Using OPNET's IT DecisionGuru software to explore several alternative scenarios, it became clear that a 100-percent ATM network would result in very low bandwidth utilization. While this is fine from a performance perspective, it would expose the government to significant unnecessary costs. On the other hand, replacing all the ATM links with lower-cost T1 lines would result in unacceptably poor performance. Based on IT DecisionGuru's simulations, SBC created a design that selectively replaced low-utilization ATM circuits with T1 lines without sacrificing network service levels. This modification reduced the government's expected WAN costs by millions of dollars over the term of the SBC contract."

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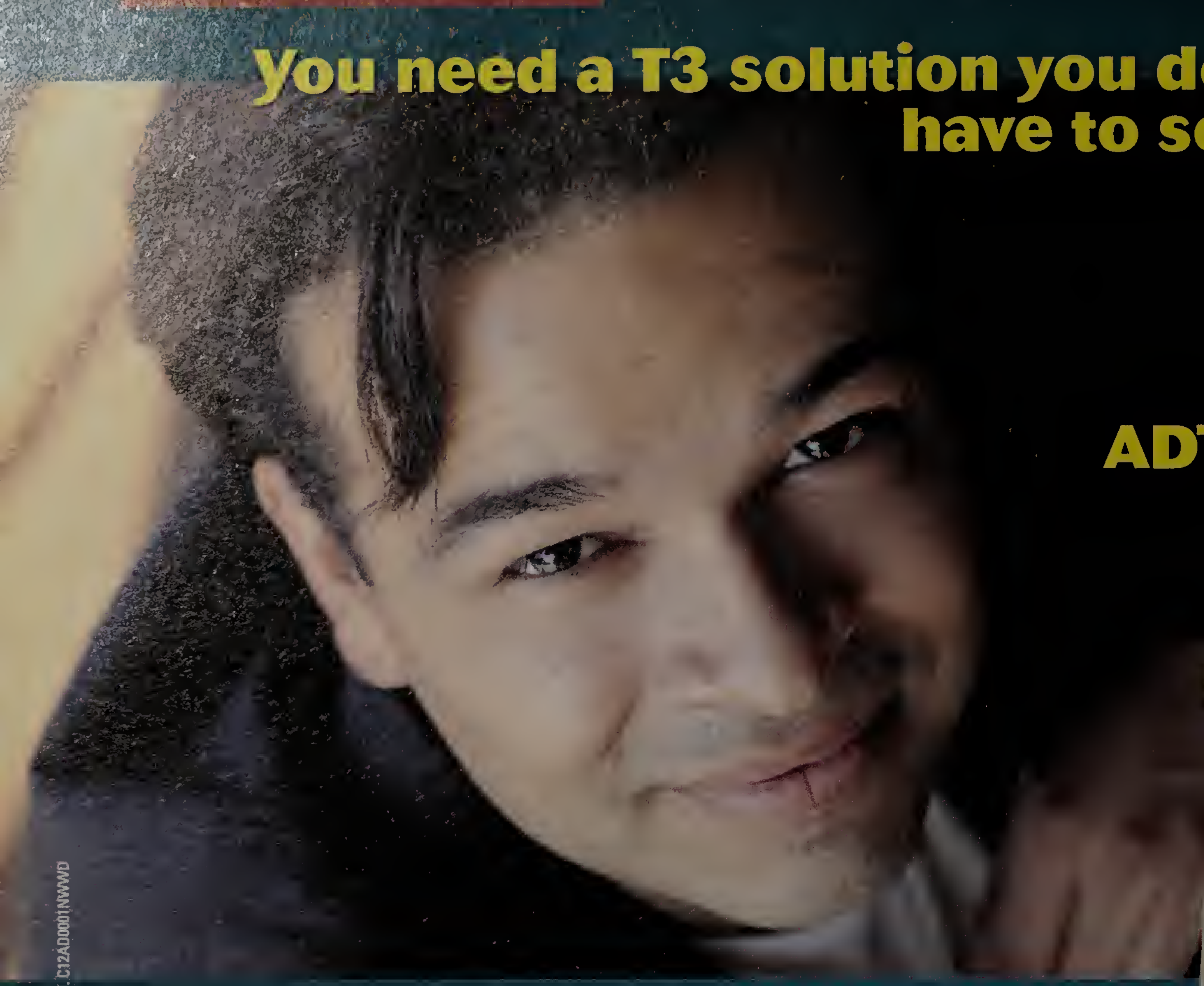
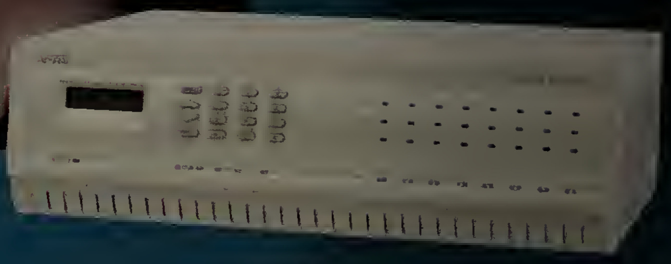
WAN CONNECTIVITY SOLUTIONS T3 T1 E1 FRAME RELAY xDSL HDSL HDSL2 ISDN DDS WIRELESS

you need a T3 solution you don't have to second guess.



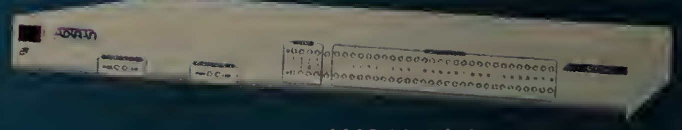
ADTRAN delivers.

T3 DSU/CSU
Modular interfaces include HSSI, V.35 and a unique DSX-1.



T3 Integrated Access Device
Multiplexing and switching platform for large-scale voice/data/video integration.

3/1/0 Digital Cross Connect System
Easily managed, scalable system for affordable time slot interchange.



M13 Multiplexer
Intelligent redundancy prevents network disruption.

There's no need to take a chance when migrating from T1 to T3 technology. You already know the vendor that makes things work.

Versatile, reliable tools for managing voice, data, video and Internet access across your T3 connection.

The one that has millions of products installed in today's communications networks, on enterprise circuits and throughout the local loop. The one that sells more T1 integrated access devices and DSU/CSUs than any other vendor worldwide. The one you can rely on time and again for cost-effective solutions, reliable performance, and service beyond your greatest expectations—regardless of the technology involved.

Why look anywhere else?

ADTRAN is the undisputed choice for T3 connectivity. And we have the product set to prove it.

For information on how to select the right device for your T3 applications, visit *www.adtran.com/t3*. Or call **877 212-0327** toll-free and ask for the *T3 Buyer's Guide* package.

All ADTRAN wide area connectivity products are certified Y2K compliant.

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Spring 1999 Update: Wide Area Networks, Dataquest, May 31, 1999.
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